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My Models & how to

First-Edition - Part Two

Directly published on the Web via Model's Forums

First Edition - December 2019

Model's INDEX

Esterel 45"

New Design.

No Rules apply yet.

LOA 45"	1150mm
LWL	1080mm
Beam	170mm
Wbeam	160mm
DSPL	3850 g

The American Model Yacht Association AMYA has some 36 registered Models Classes.
IRSA has only fewer registered as: Class A, 10Tater, Marblehead, IOM, and RG65.

Other Classes are registered in other Countries as the DF95.
According to my short research, some ~40 RC Models are available on the market.

The ones sitting between 37" and 45" of length are about 11 different types.
In the American market there is only one model with 45" of length this is the Star developed in 1960.

Personally, I found the IOM Rules obsolete in term of technological progress.
When discussing the matter, thousand of justifications are given.

For instance, why the carbon fiber is accepted for the Fin and Rudder and not for the Booms or Mast or for the Hull lamination?
Matter of costs?
According to the supplier:

https://shop1.r-g.de/en/list/Fibre-reinforcements/Glass-fibre

the difference in costs between a Glass tissue of 80g/m² and the one in Carbon of 93g/m² is only 32€.
Actually the price of a complete IOM ready for sailing is about 3000 - 3200 $.
The use of Carbon tissue would be equivalent to 1% of the total !

Since many models including low cost Toys can be bought for 1/10 of the IOM price, why a new model then?

In the last 5 or 7 years the Electronics made quite a big progress by reducing the weights.

At 2005, the Weight Budget of my Models was sitting around 320g.

Five years later, in 2010, the same elements like Batteries and servos where around 240g, today in 2019 the same budget is close to 150g. Not only, but the servos are also offering better performances.

I'm of the opinion that searching, here and there, it is possible to make weight economies, after all, is one of the "guiding rules" of the modeler when building something.

Strong yes, but just what it is needed!
The sailing model is not supposed to resist to a crash against a concrete wall…

I'm also of the opinion that, all parameters being the same, the lighter boat will be the faster.

The sailing shall be visible from 100 yards distance in order to control it, but still loadable in the car trunk.

With the experience gained with the AC120 as well with the AC100, I have found out that these models can perform very well with Sail Surfaces above the average for models of that size.

One of the reasons may be due to the Mast height that is generally shorter, hence the CE position, but also the sail shapes.

Having widely considered all aspects, I decided to draw a new RC Model independently of any established Rules.

This experimental model it is called:

Esterel 45"

The table below refers to specifications of few models in the dimensions indicated including a new design.

Comparative data of some RC sail Models   from 100 cm to 129 cm

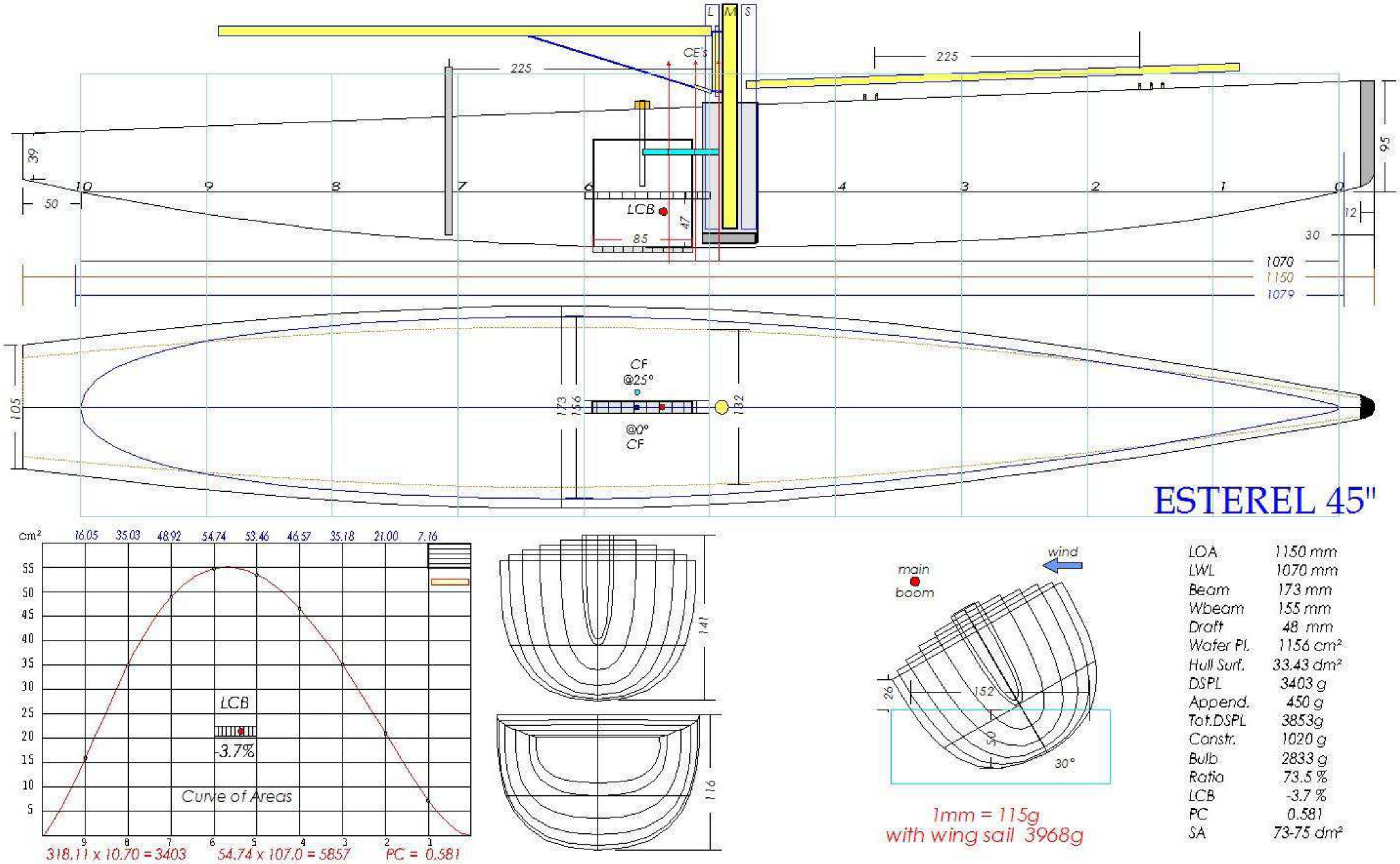
Data	123 Model	AC100/B	Class IOM	Class M	Class AC120	NEW Mod.
LOA	1230mm	1000mm	1000 mm	1290 mm	1200 mm	1145 mm
LWL	1150mm	850mm	1000 mm	1210 mm min	1000 mm max	Free
Beam	173 mm	154 mm	Free	Free	165 mm min	Free
Hull Draft	48 mm	45 mm	60 mm	Free	Free	Free
Deept	480 mm	450 mm	420 mm *	660mm max	420 mm	500 mm
Append.	456 cm3	316 cm3	360 cm3	460cm3	430cm3	460 cm3
Hull Vol.	3670 g	2500 g	3640 g	Free	4070 g	3390 g
DSPL	4226 g	2816 g	4000 g	Free	4500 g min	3850 g min
Mast	1735 mm	1500 mm	1600 mm	2160 mm	1750 mm	1800 mm
Sail Area	7600 cm^2	5200 cm^2	6200 cm^2 **	7200 cm^2 ***	8000 cm^2	7300 cm^2
Main Top	160 mm	80 mm	20 mm	20/40 mm	60-200 mm	160 mm
Bulb	2.95 kg	1.76 kg	2.4 kg	na	2.9 kg	2.65 kg max
Fin Keel	na	na	2.5 kg max	na	3.0 kg max	na
Construction	1180 g	1050g	2000 g	~1500 g	~1500 g	~1200 g ****

OVERALL RATIOS

Bulb Ratio	71 %	61.5%	60%	na	64%	>73%
SA / DSPL	1.81	25.7	1.55	na	1.77	1.81
Fin x Bulb R.A.	141.6 kg/cm	78.7kg/cm	100.8 kg/cm	na	129 kg/cm	132 kg/cm

* From Water Line
** Expected according to IOM Rules
*** 0.5161 m^2 as per Class Rules - Real Surface ~ 7200 cm^2
**** New Servos & Battery technology allow lighter construction

Because of the new Battery technology and Servos progress from Analog to Digital technique, the construction is one of the parameters where the major gain it is expected.
The Overall Ratio table is showing that the Bulb weight could be close to 70% against the IOM with 60%, and Sail Area/Dspl ratio of 1.81 against the IOM with 1.55.
Under these conditions, it is expected that the Esterel 45" could use more sail area.


ESTEREL 45"
225
225
CE's
L
M
S
LCB
85
47
39
50
95
12
30
1070
1150
1079
105
173
156
132
CF
@25°
@0°
CF
cm²
16.05 35.03 48.92 54.74 53.46 46.57 35.18 21.00 7.16
LCB
-3.7%
Curve of Areas
318.11 x 10.70 = 3403
54.74 x 107.0 = 5857
PC = 0.581
141
116
main
boom
wind
152
26
50
30°
1mm = 115g
with wing sail 3968g
LOA 1150 mm
LWL 1070 mm
Beam 173 mm
Wbeam 155 mm
Draft 48 mm
Water Pl. 1156 cm²
Hull Surf. 33.43 dm²
DSPL 3403 g
Append. 450 g
Tot.DSPL 3853g
Constr. 1020 g
Bulb 2833 g
Ratio 73.5 %
LCB -3.7 %
PC 0.581
SA 73-75 dm²

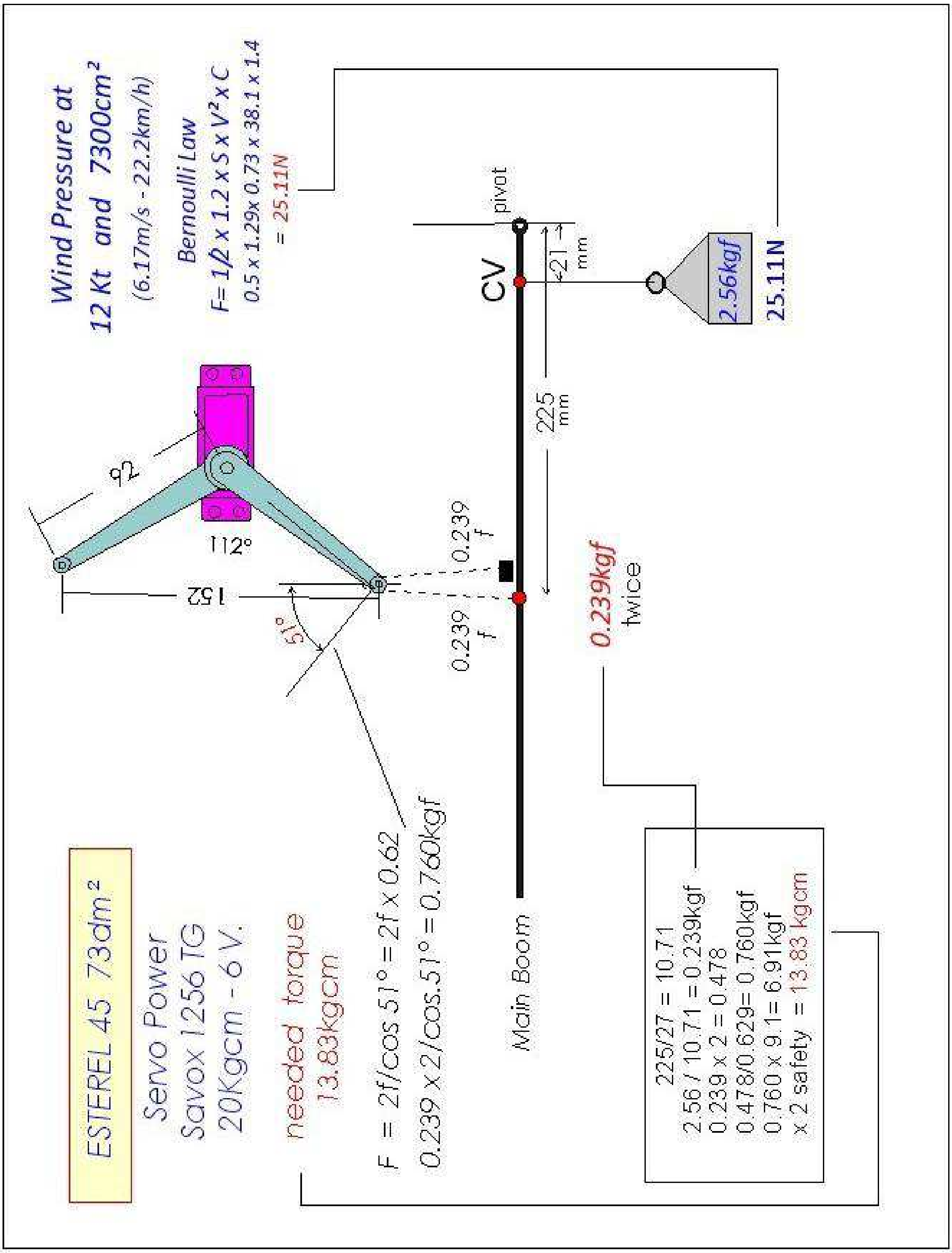
About Rig

Sails design approach for Esterel 45.
From books, the **aspect ratio** is the paramount parameter to increase sail efficiency and VMG performances. Higher is, better is, but!
The high aspect ratio does produce also a higher CE point that will reduce the lateral stability.
As usual a compromise is needed!

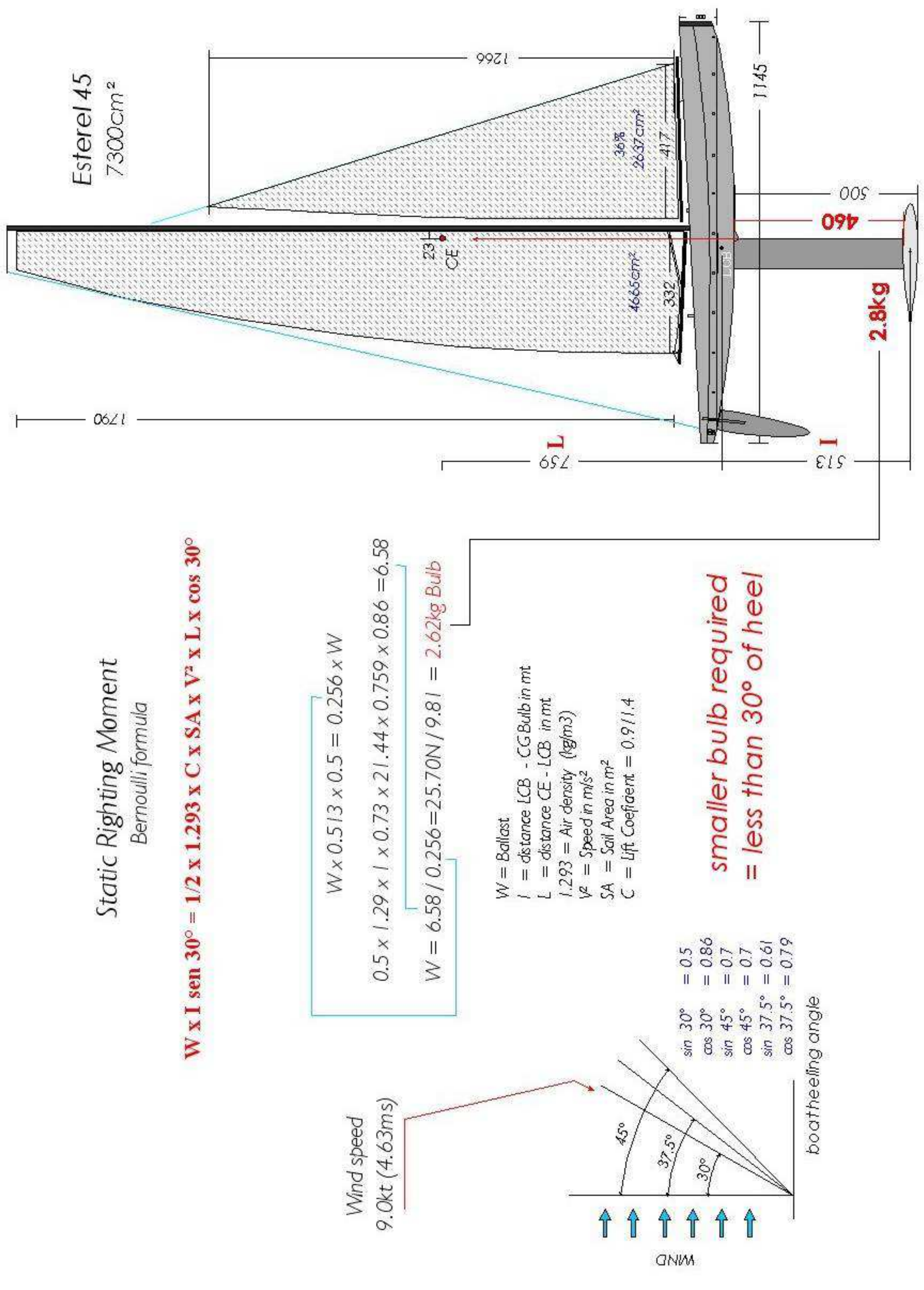
The **Jib luff** is generally dimensioned to the 8/10 of the Main luff.
I would consider a **7/8** for Esterel 45.
Just to quantify this point: the nominal Rig 1 Main luff is ~1600mm
With the 8/10 option, the Jib luff will be : 1600 x 0.8 = 1280mm
With the 7/8 option, the Jib luff will be : 1600/8 x 7 = 1400mm
It is expected a better performance with the 7/8 Jib.
The mast shall be tailored as consequence. The CE position is considered too.

About the **surface ratio** between Main and Jib, the following considerations are taken:

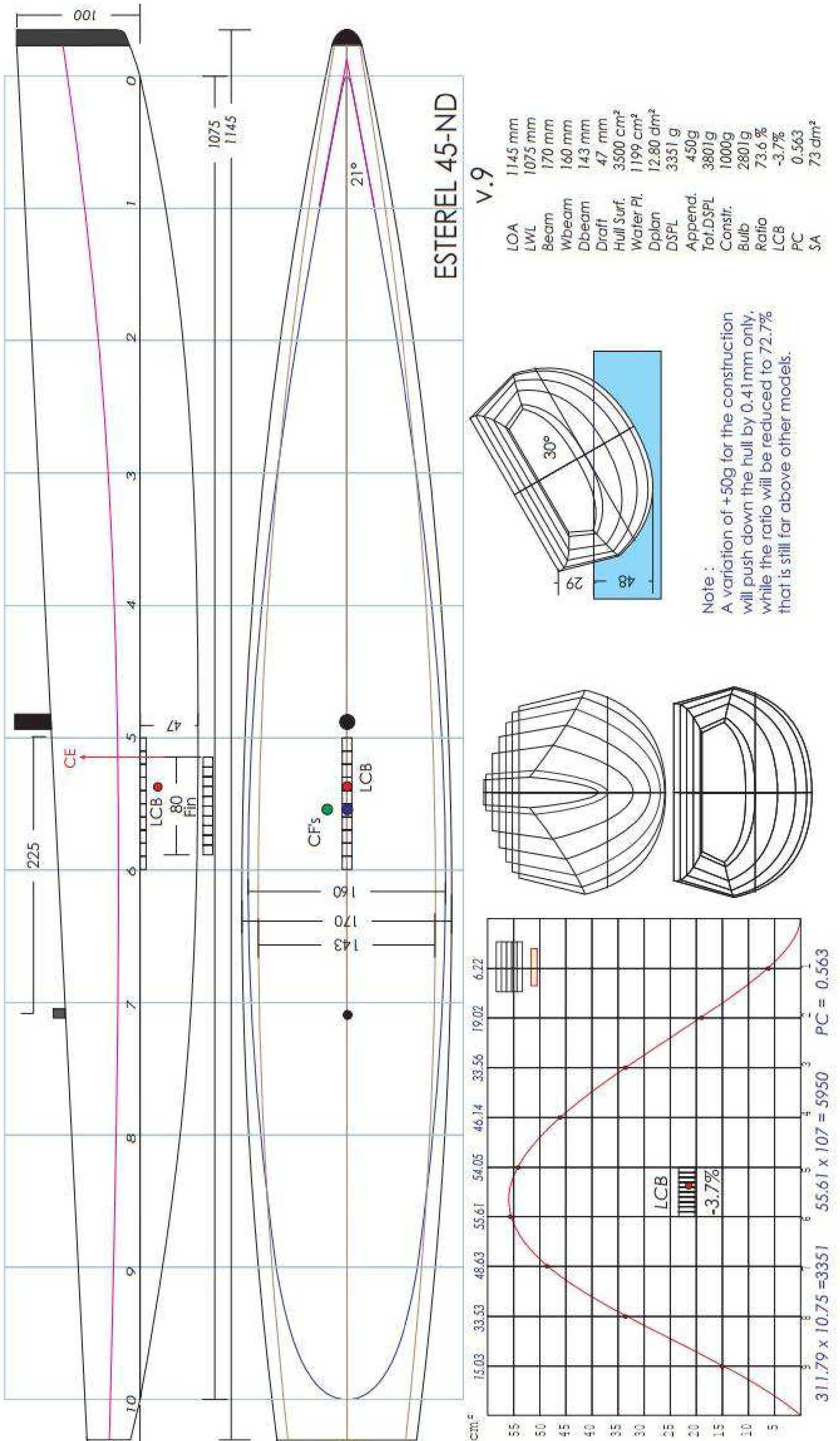
- The Jib is providing most of the sail power.
- The Jib, out of the two sails, do not suffer mast turbulences because working on “clean air” and because of that there is the interest to increase the surface as much as possible compared with the Main.
- The Jib surface percentage will vary from 30% to 45% of Main surface
- Genoa is not considered.
- The Jib leech will be as close as possible to the mast and probably with a small roach.
- I will keep the Jib as close as possible to the deck with the Radial boom.

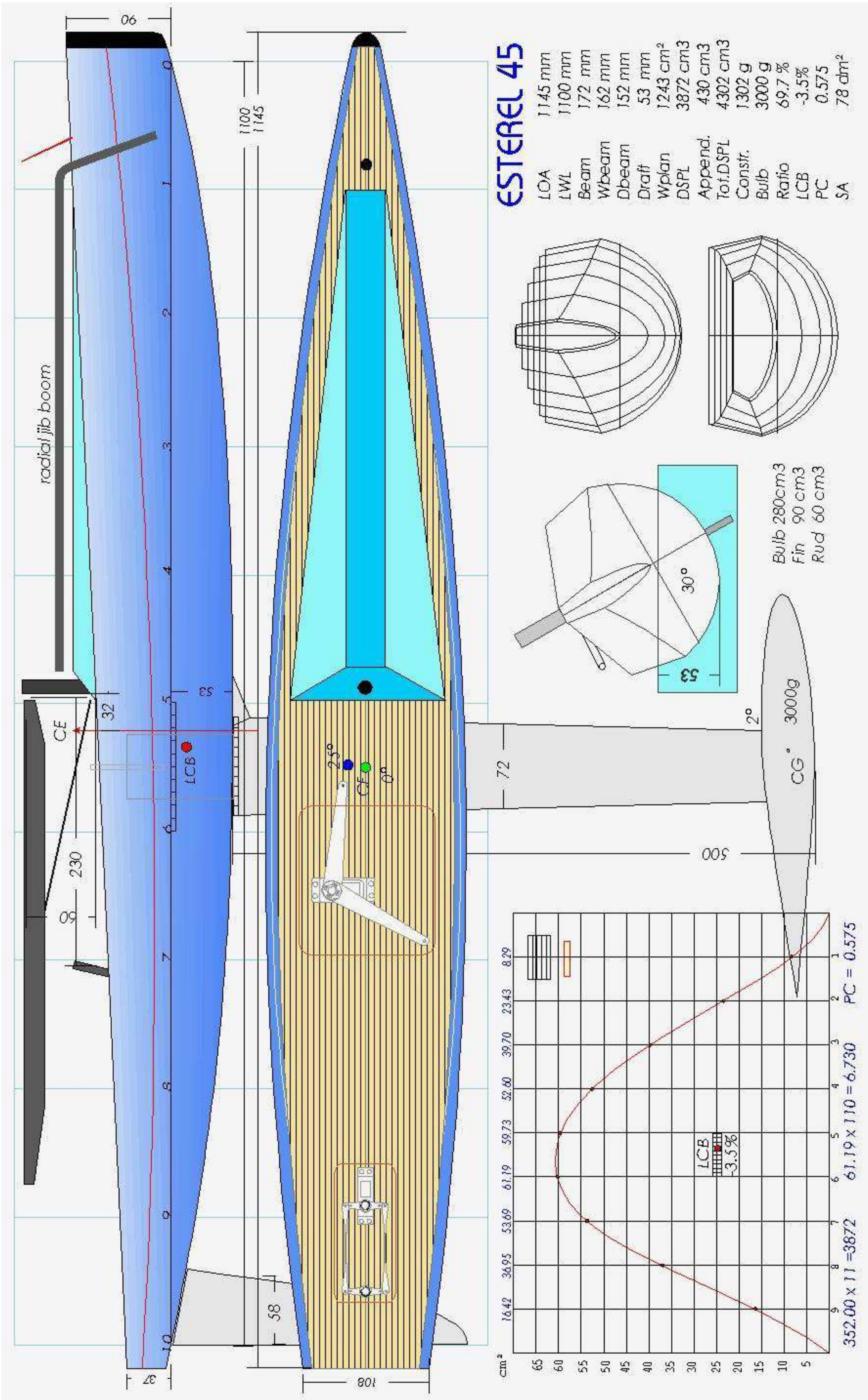


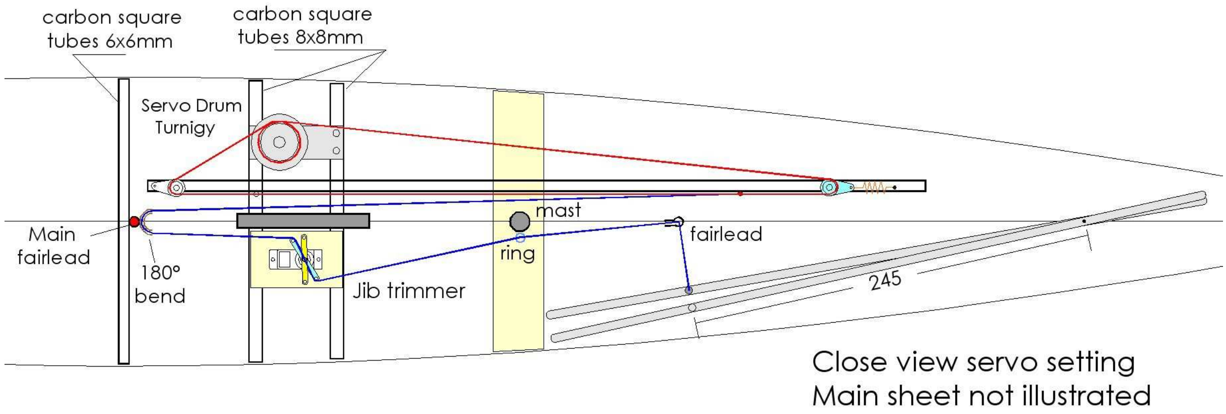
This is an example of the use of the Savox 1250 Servo.
The calculations are for a wind force of 12kt and the pull force required is 13.83 kg/cm while the Servo is offering a 20kgcm.
A recent winch servo model like the Turnigy TGY 6114MD could be considered too.



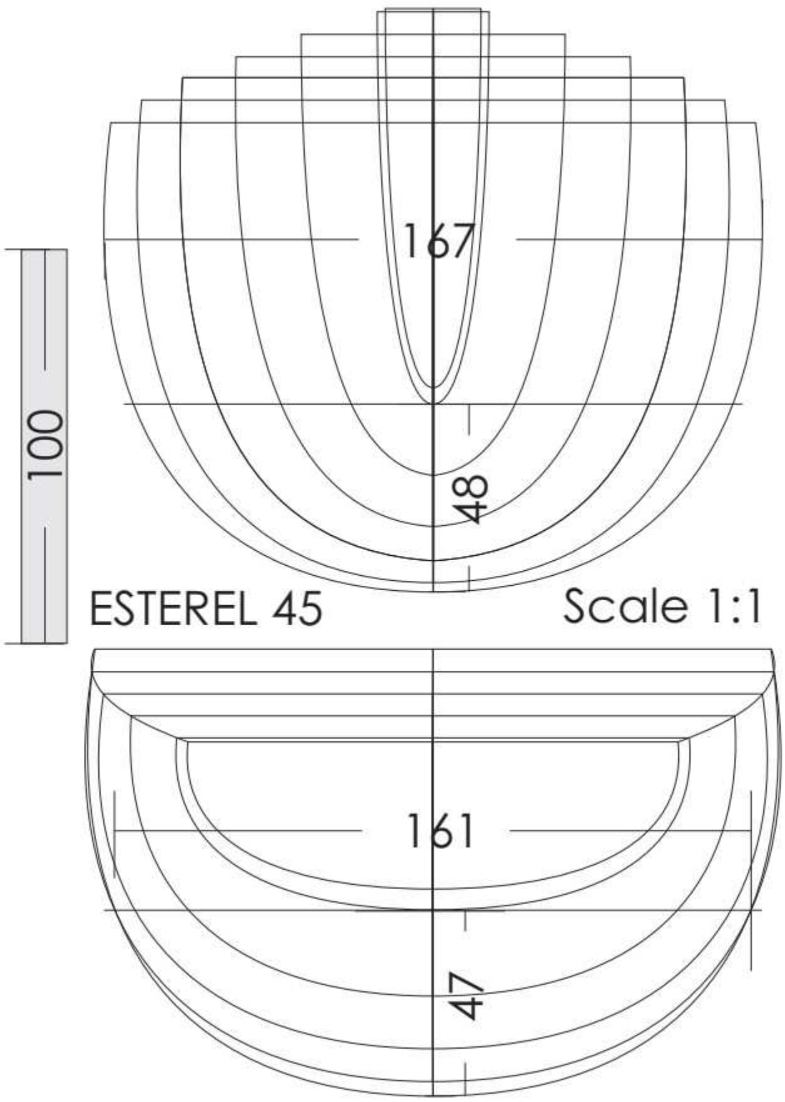
This diagram, representing the Static righting moment, is relatively pessimistic since real wind direction on the Sails is not included.


ESTEREL 45-ND
v.9
LOA 1145 mm
LWL 1075 mm
Beam 170 mm
Wbeam 160 mm
Dbeam 143 mm
Draft 47 mm
Hull Surf. 3500 cm²
Water Pl. 1199 cm²
Dplan 12.80 dm²
DSPL 3351 g
Append. 450g
Tot.DSPL 3801g
Constr. 1000g
Bulb 2801g
Ratio 73.6 %
LCB -3.7%
PC 0.563
SA 73 dm²
Note :
A variation of +50g for the construction
will push down the hull by 0.41mm only,
while the ratio will be reduced to 72.7%
that is still far above other models.
30°
21°
CE
LCB
CF's
80
Fin
225
1075
1145
160
170
143
113
100
47
43
29
48
LCB
-3.7%
311.79 x 10.75 =3351
55.61 x 107 = 5950
PC = 0.563


ESTEREL 45
LOA 1145 mm
LWL 1100 mm
Beam 172 mm
Wbeam 162 mm
Dbeam 152 mm
Draft 53 mm
Wplan 1243 cm²
DSPL 3872 cm3
Append. 430 cm3
Tot.DSPL 4302 cm3
Constr. 1302 g
Bulb 3000 g
Ratio 69.7 %
LCB -3.5%
PC 0.575
SA 78 dm²
radial jib boom
Bulb 280cm3
Fin 90 cm3
Rud 60 cm3
30°
CG 3000g
LCB -3.5%
352.00 x 11 =3872
61.19 x 110 = 6.730
PC = 0.575



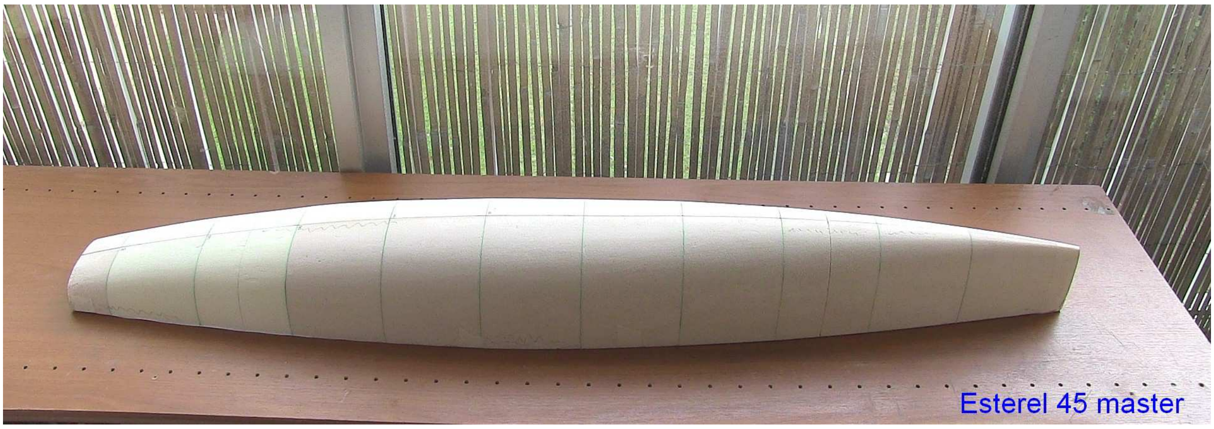
Optional Jib trimmer 3rd servo



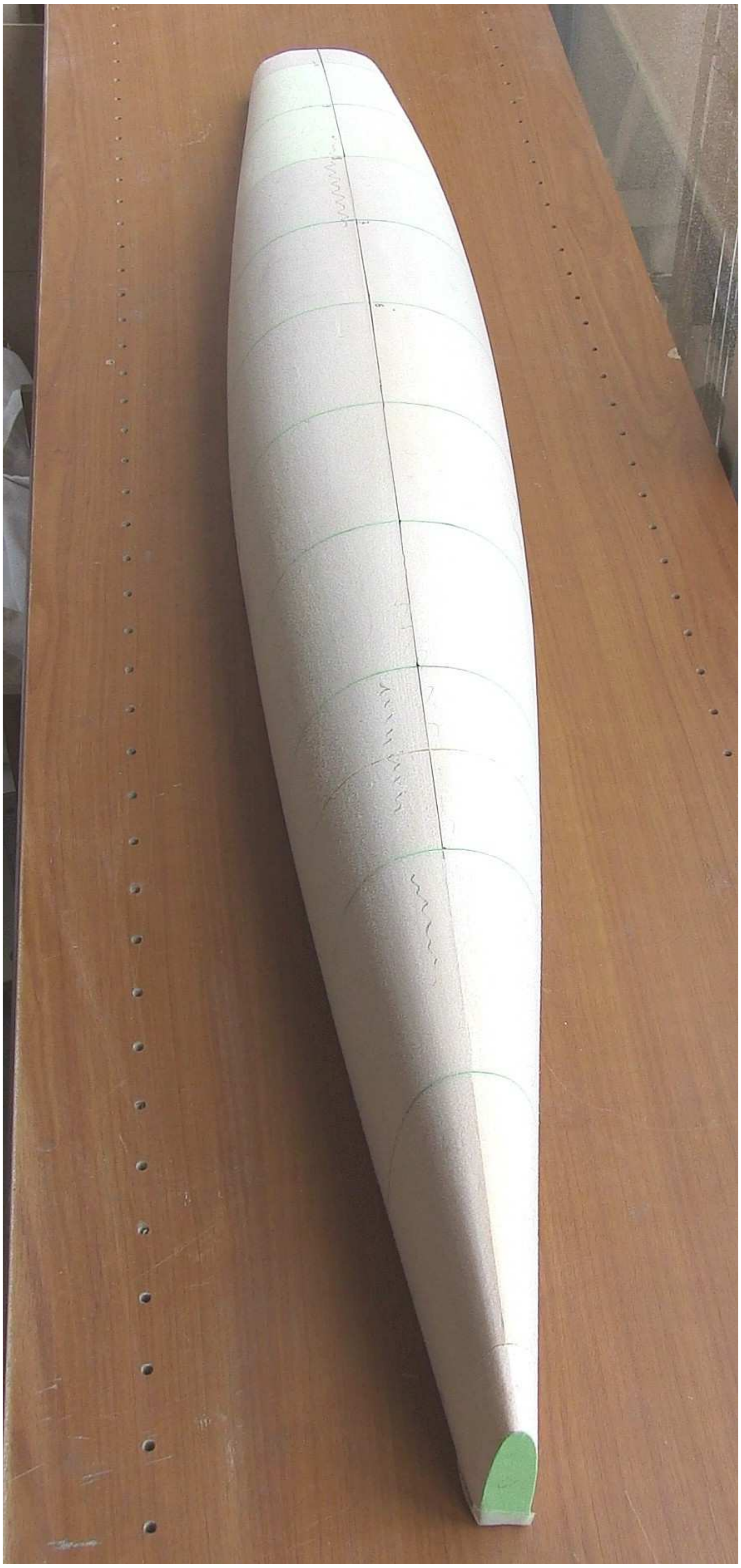
Construction

For Hull Master I used the extruded polystyrene foam.

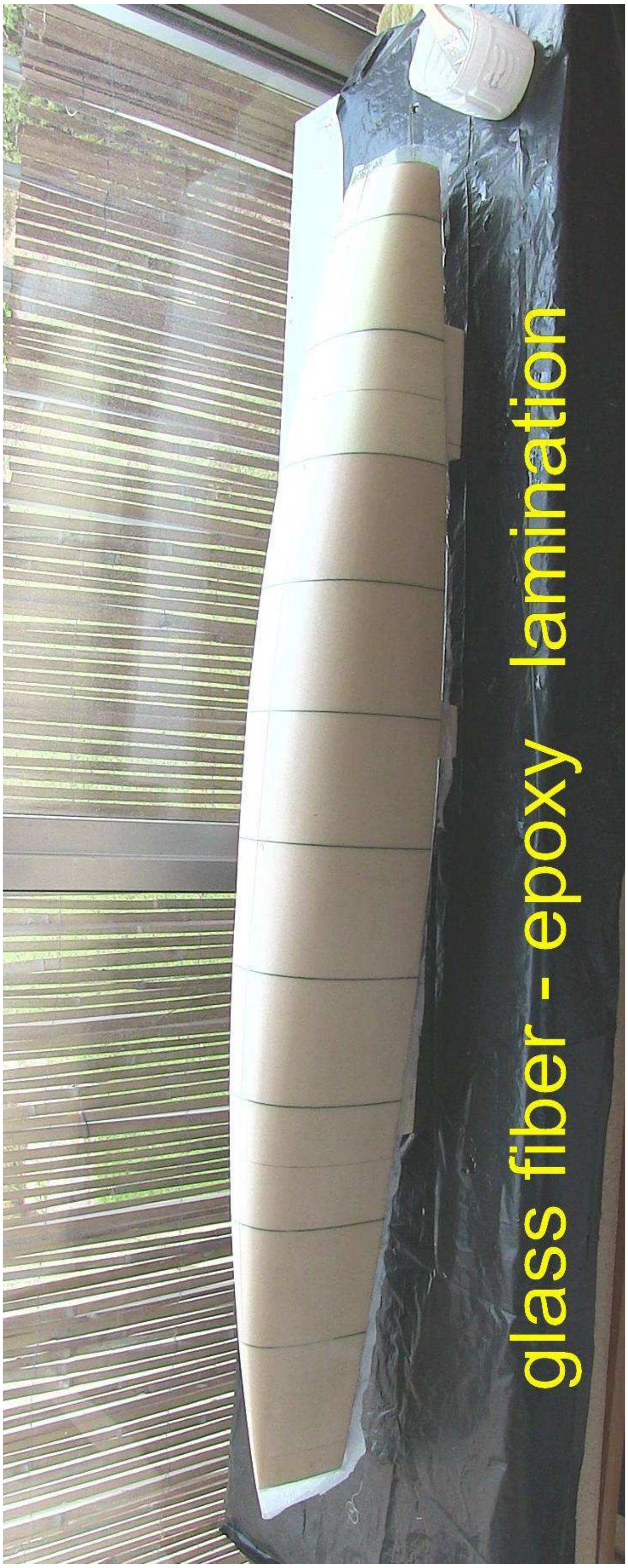
The plywood shadows are used as guides for the Hotwire cut.

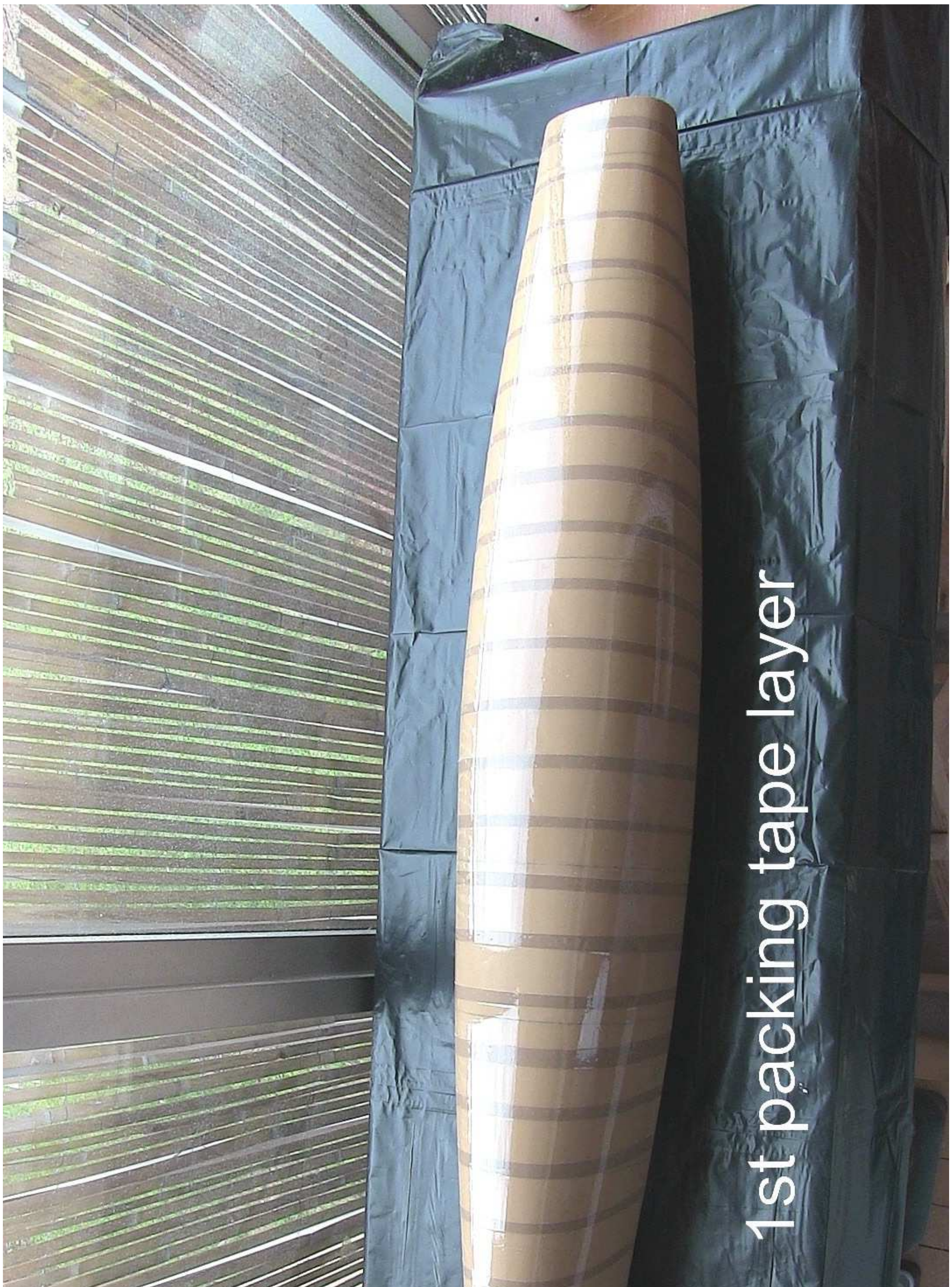


Assembled Hull with epoxy bond followed by sanding with 100 grid



The assembled Master Hull is covered with Glass-Epoxy to increase surface strength




1st packing tape layer

Hull covered with packing tape to avoid resin adhesion during Hull lamination

The Esterel 45 Hull exhibit a surface of 33.5dm².

Option 1
To use for the hull 3 layers of Glass Tissue:

$$0.8\text{g/dm}^2 \times 3 \times 2 \text{ (for resin)} \times 33.5 \text{ dm}^2 = \mathbf{160.8g}$$

Option 2
To use 2 layers of Glass tissue and 1 layer of 63g/m² Kevlar

$$(0.8+0.8+0.63) \times 2 \times 33.5 = \mathbf{149.4g}$$

Option 3
To use 93g/m² Carbon tissue and 63g/m² Kevlar tissue to compensate the fragility of polymerized carbon fiber against shocks

In sequence: $(0.93+0.63+0.93) \times 2 \times 33.5 =$ **166.8g**

Thus the bare hull weight is between 150g and 170 g

Deck

Deck surface is 11.6 dm²

Two layers of Glass fiber of 80g/m² : $0.8 \text{x} 2 \text{x} 2 \text{x} 11.6 =$ **37.1g**

Deck assembly requires wood stripes along the deck sheer line.

By practice, obeche strings of 3x5mm + epoxy resin will weight about **25g.**

The "closed" hull will weight less than 235g

In order to complete the hull it will be added the weights for the Fin Box, Rudder Trunk and Servo supports as well the radial jib anchoring and various hardware.

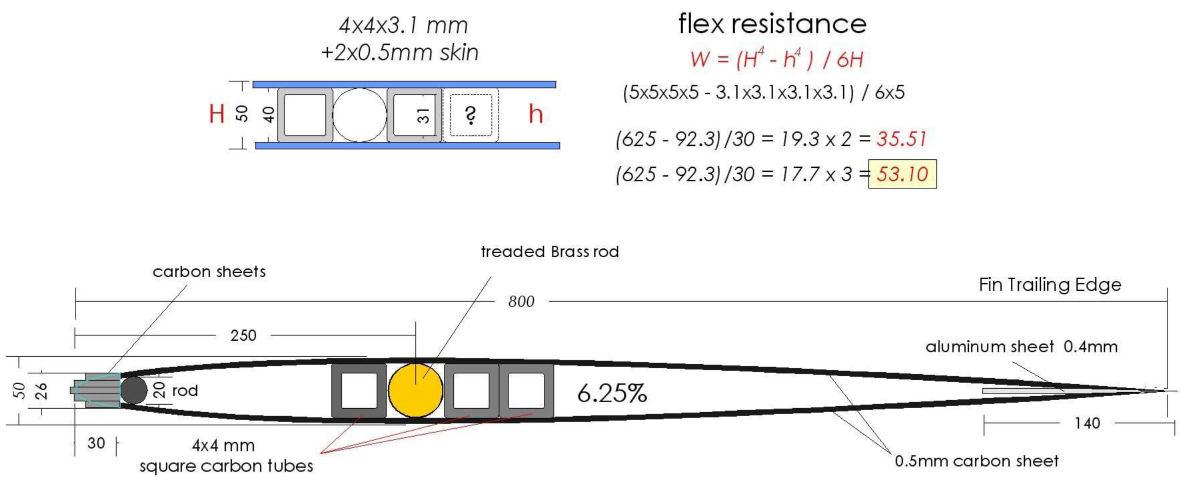
Esterel 45 (1050) budget

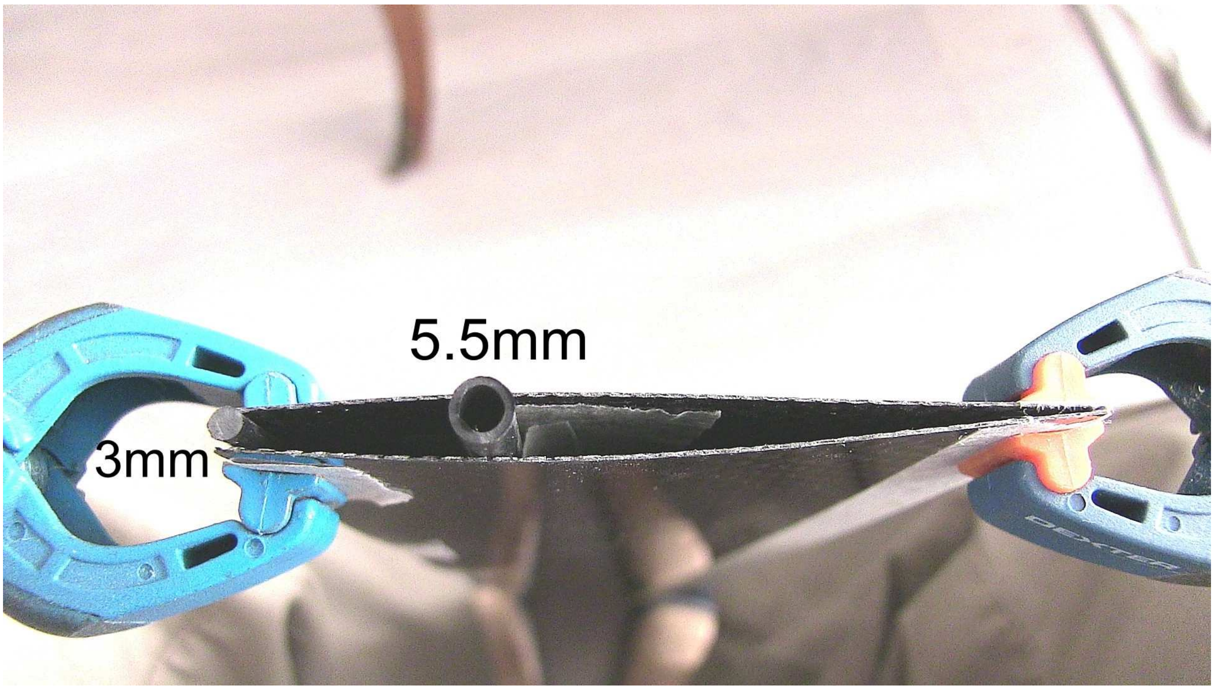
Hull	160	33.5dm²
Deck	40	11.6dm²
Hull Reinf.	30	patches
Servos	85	Turnigy Drum /Savox Arm + Savox-SH0255
Battery	70	4x1.5V AA dry lithium 2000Ma (57g for 800mA)
Rx	12	Hitec
Fin	150	Selfmade ?
Rudder	30	Selfmade
Rig	300	Rig (280g possible)
Trunks	30	Fin - Rudder -
Struts	25	Fin - Jib
Supports	50	carbon square tubes, etc
Hardware	60	fairleads, pulleys, eyebolts,turnbuckles, etc.
Total	1042g	
Rounded at	1050g	
Bulb	2800g	
Boat	3850g	- 438g appendages = Min. Hull DSPL 3850g - 438 = 3412g
ratio	72.7%	

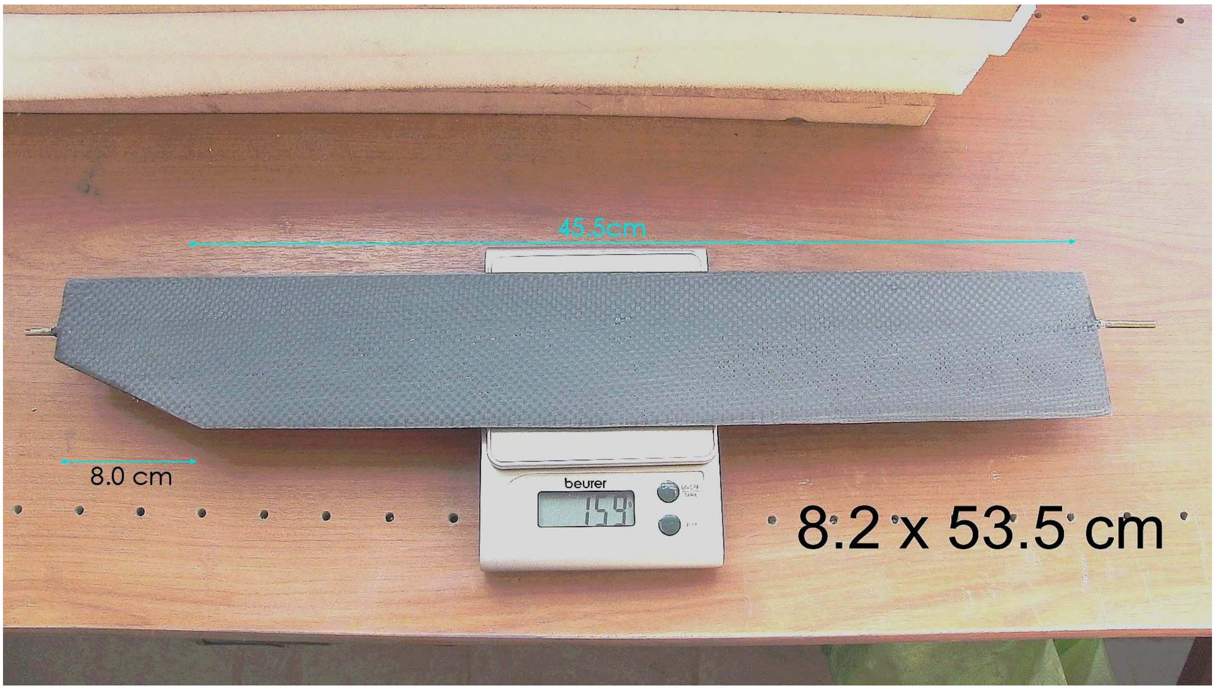
The total expected Esterel 45 weight is 3850g at the buoy !

The weight of the Fin is not fully established; hope to find a solution to reduce it further.

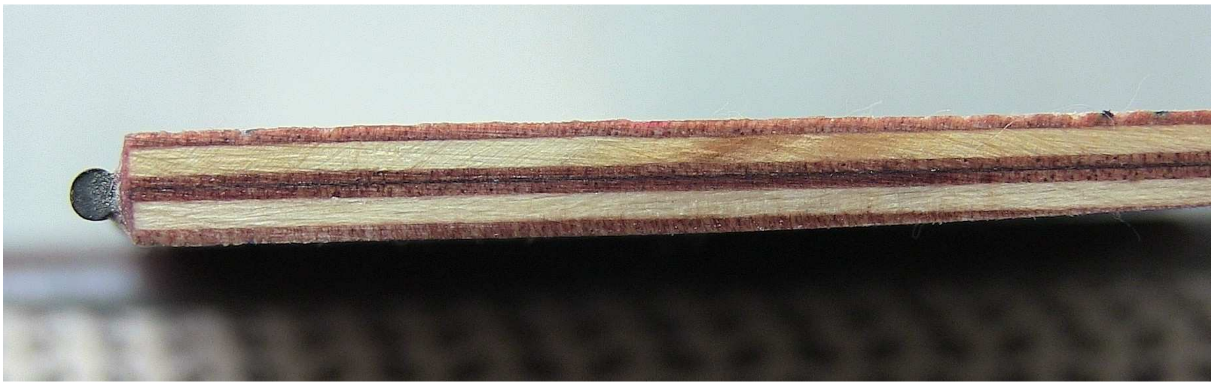
Full Carbon assembly with square carbon tubes

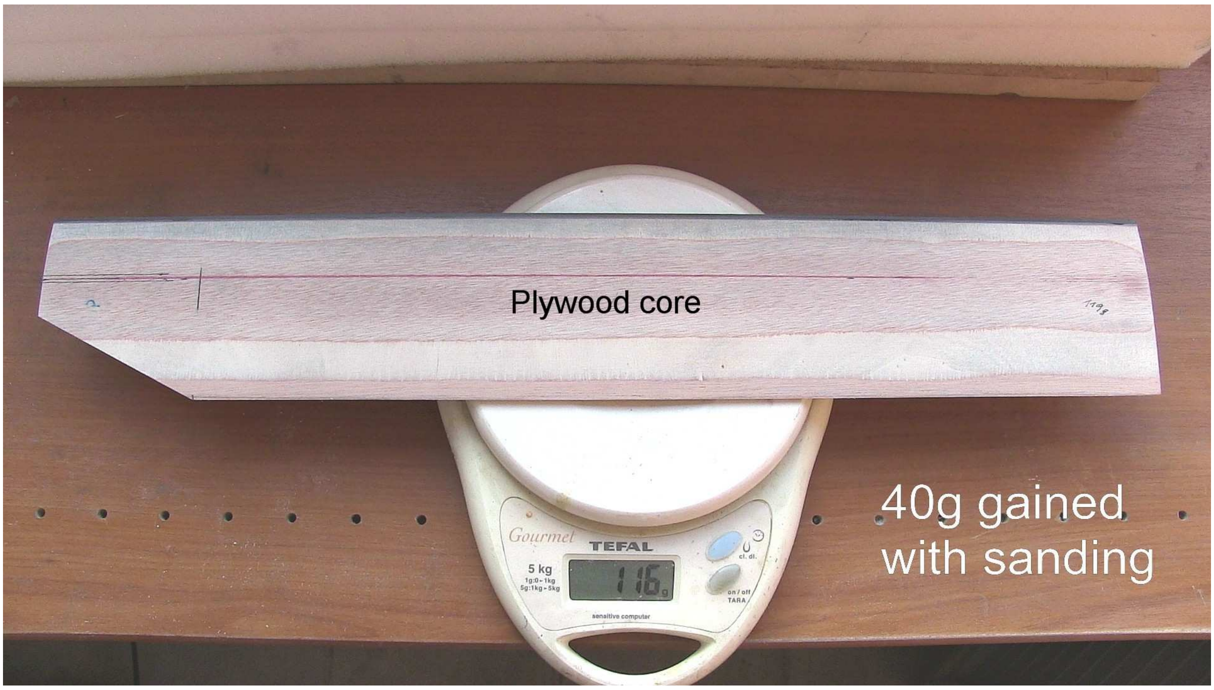






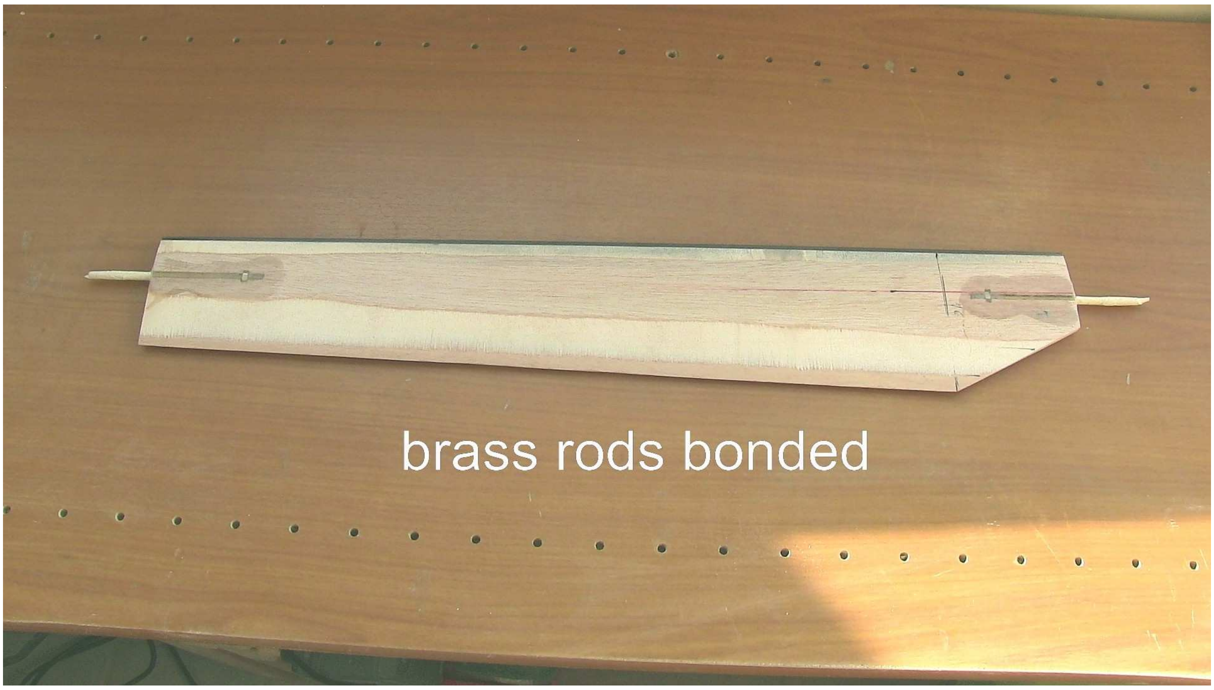
Second Fin plywood core trial





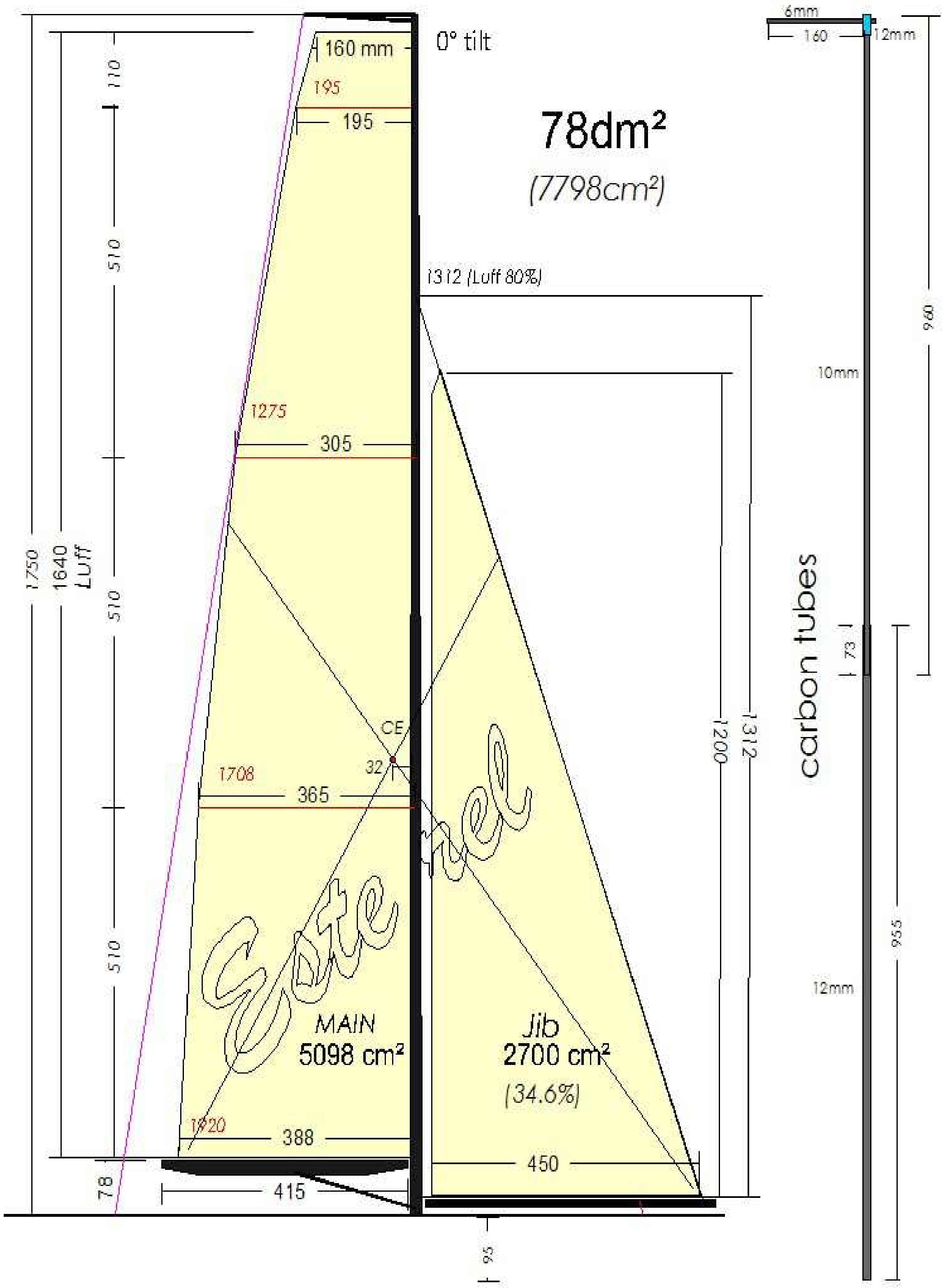
About the Fin construction the work is not completed yet.

Up to now the specified weight and rigidity are not yet achieved, further experimental work is needed.
No vacuum or sophisticated tooling used so far.
Most of the modelers, including myself, do not have the equipments for.



Rig

According to previous experience the Rig weight is very close to the one used for the AC120 being about 280g.



Cost budget (estimated)

Esterel 45 - Costs Budget (extimation)

Hull	33.5dm²	glass tissue 80g/m²		
Deck	12.8dm²	glass tissue 80g/m²	resin included	= 30.00€
Reinforcements patches	5.0dm²	glass tissue 110g/m²		
Battery	4x1.5V - 800ma AAA Eneloop			= 25.00 €
Servo Arm	SH1256			= 65.00€
Rudder servo	Savox-SH0255			= 20.00 €
Rx	Hitec Atom DSSS			= 60.00 €
Fin	selfmade			= 30..00€
Rudder	Selfmade			
Rig	Mast Carbon tubes and Mylar tissue 75g/m²			= 40.00€
Trunks	Fin - Rudder -			
Struts	Fin - Jib			
Supports	Estimated for support elements & bondings			= 160.00€
hardware	or fairleads, pulleys, eyebolts,turnbuckles, etc.			
				430.00 €

Mast & Booms composition

Carbon tube of 12mm weight 46g/m
Carbon tube of 10mm weight 38g/m
Carbon tube of 6mm weight 23g/m

Note

The ESTEREL 45" Model is still under construction, delay caused by health problems.
The Fin weight and rigidity still need a solution, although some weights margins are available.
Wood core solution is probably too heavy.

12 Metre Class

After a long tread of 23 pages on the RCSailing.net Forum I publish here only two models :

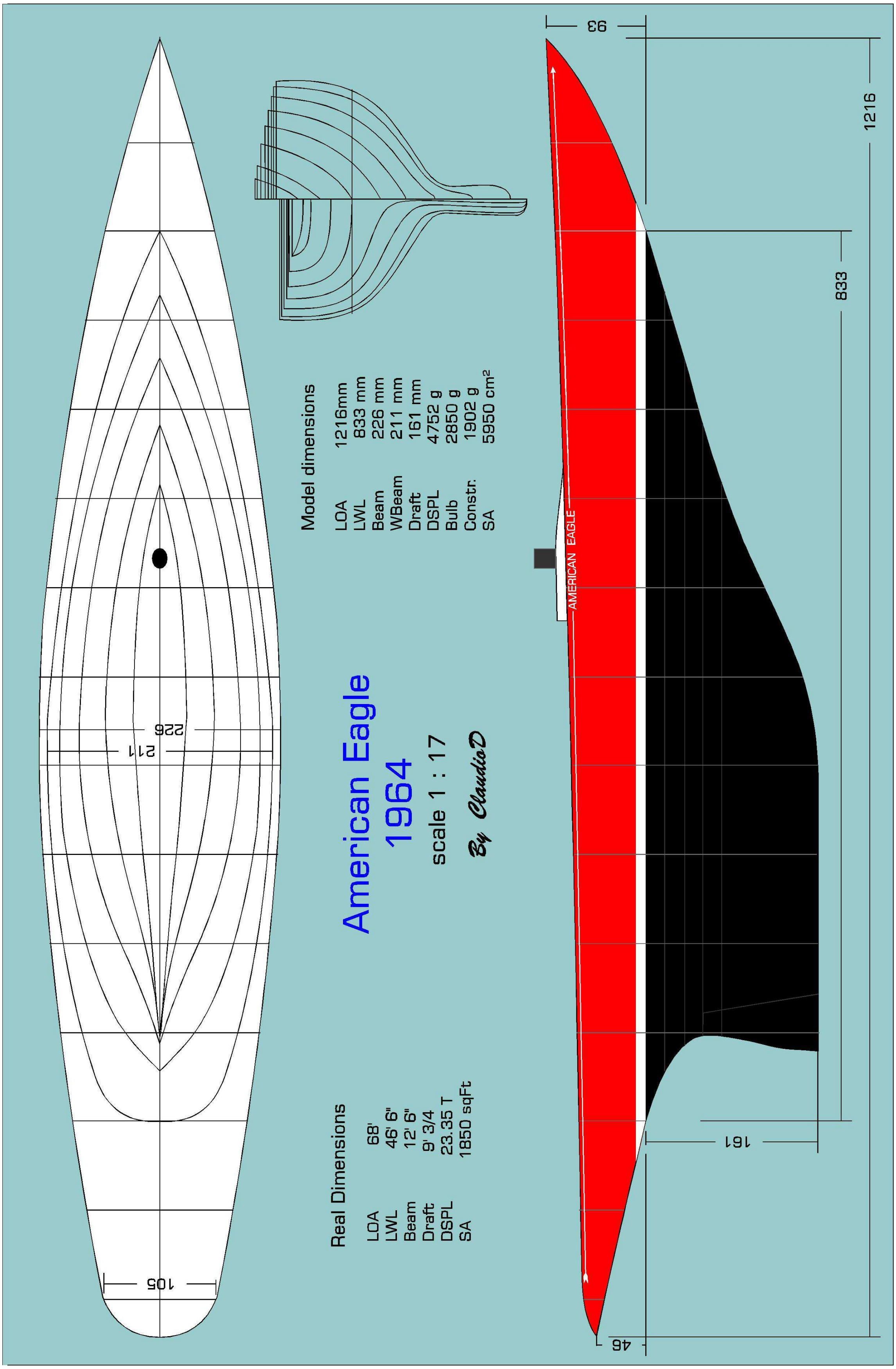
http://www.rcsailing.net/forum1/showthread.php?6900-J-Class-versus-12Metre-Class/page15&highlight=class+metres

1. American Eagle
2. Columbia 1958

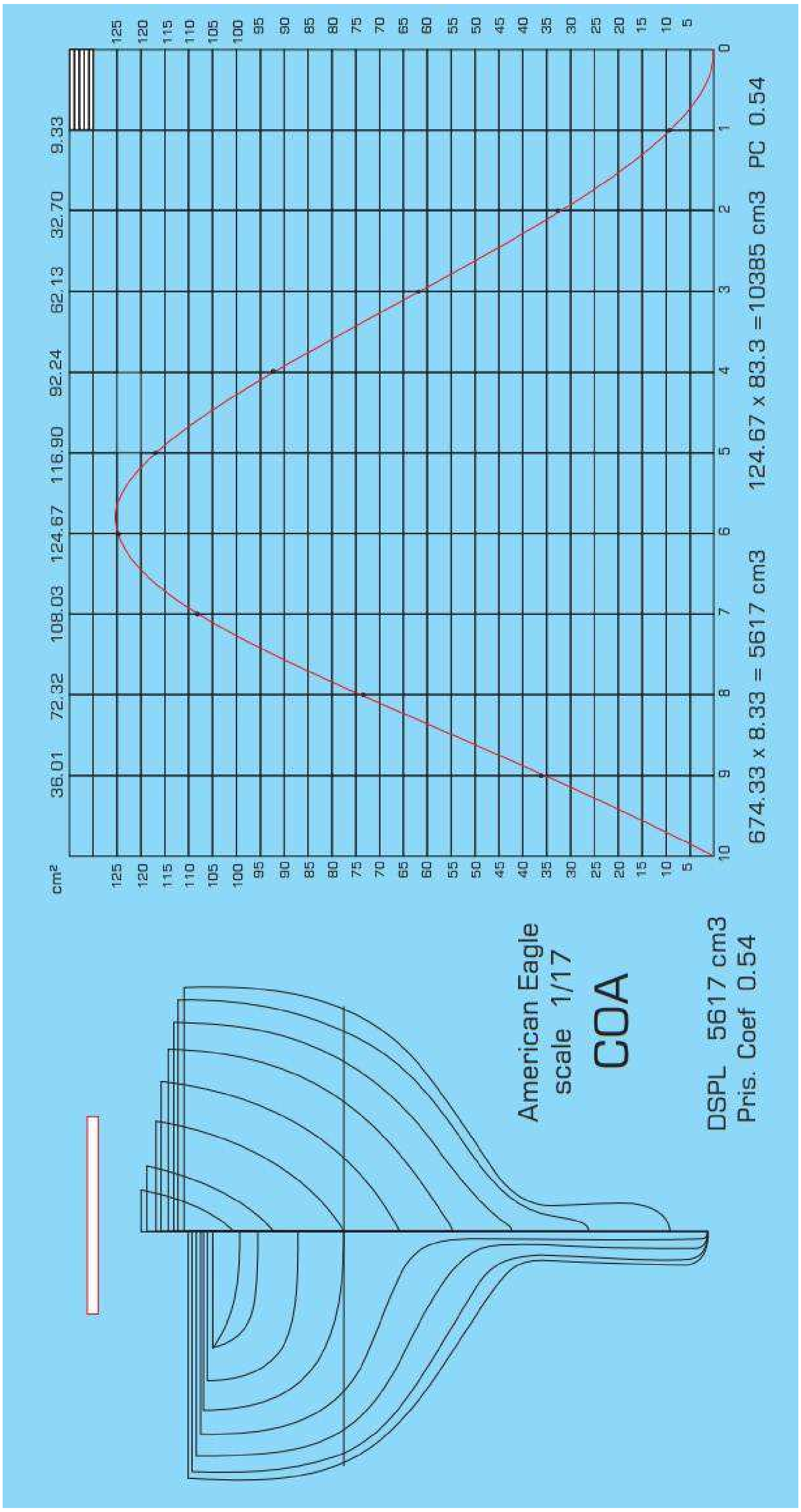
In 2013 I have proposed to combine the last class and 12 meter class to create a series of models having the same length. The most suitable scale was 1:17. In the:

One of the sources for plans was the F. Chevalier "America Cup Encyclopedia" bought some years before.

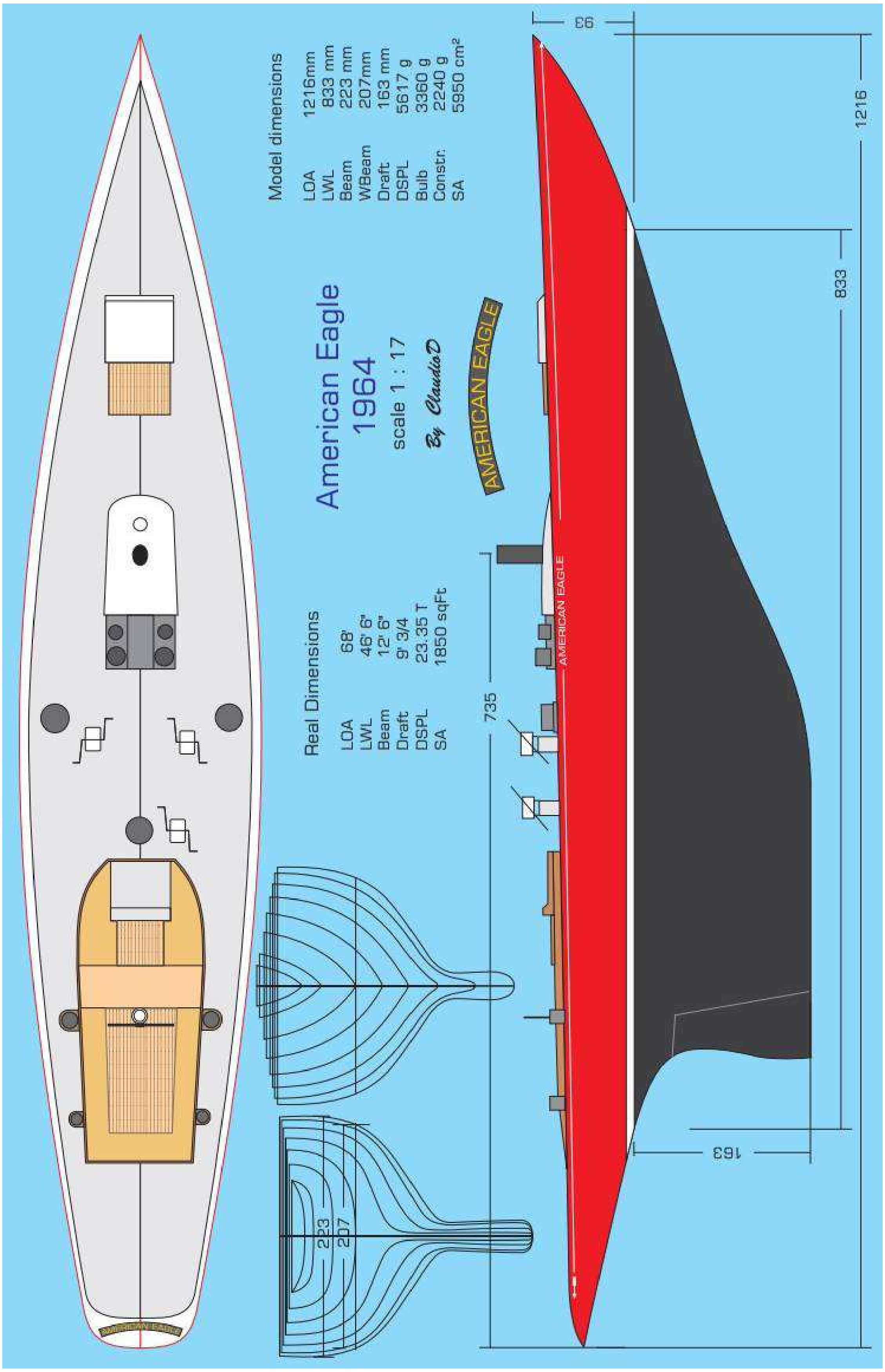
The first model I redraw for the purpose was the American Eagle. What was significant in that choice was the Eagle.


American Eagle
1964
scale 1 : 17
By ClaudioD
Model dimensions
LOA 1216mm
LWL 833 mm
Beam 226 mm
WBeam 211 mm
Draft 161 mm
DSPL 4752 g
Bulb 2850 g
Constr. 1902 g
SA 5950 cm²
Real Dimensions
LOA 68'
LWL 46' 6"
Beam 12' 6"
Draft 9' 3/4
DSPL 23.35 T
SA 1850 sqFt
AMERICAN EAGLE
1216
833
93
161
46
226
211
105

The Curve of Areas shows a prismatic Coefficient of 0.54 cmpared to the other models because the long Keel is included.

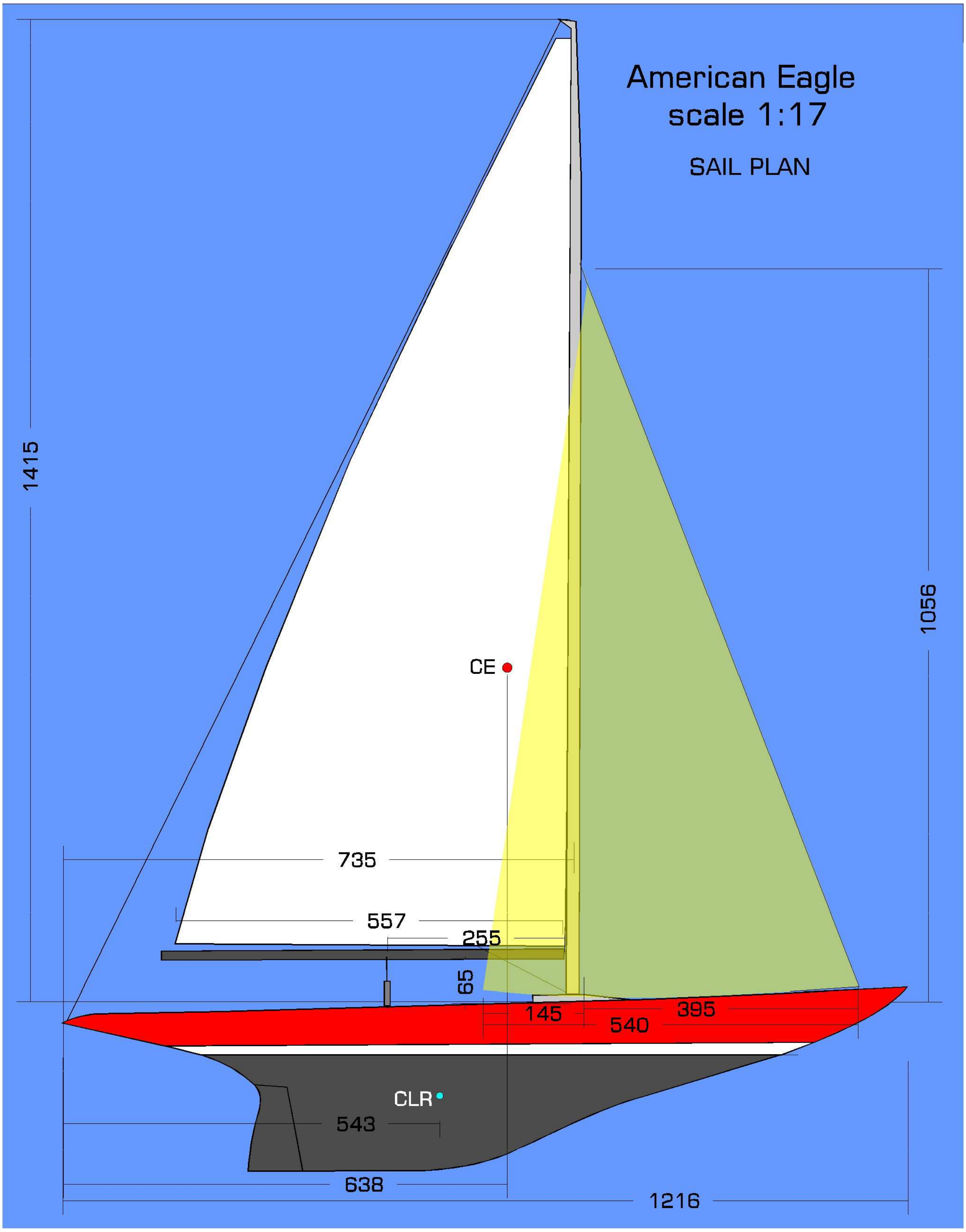


Deck layout



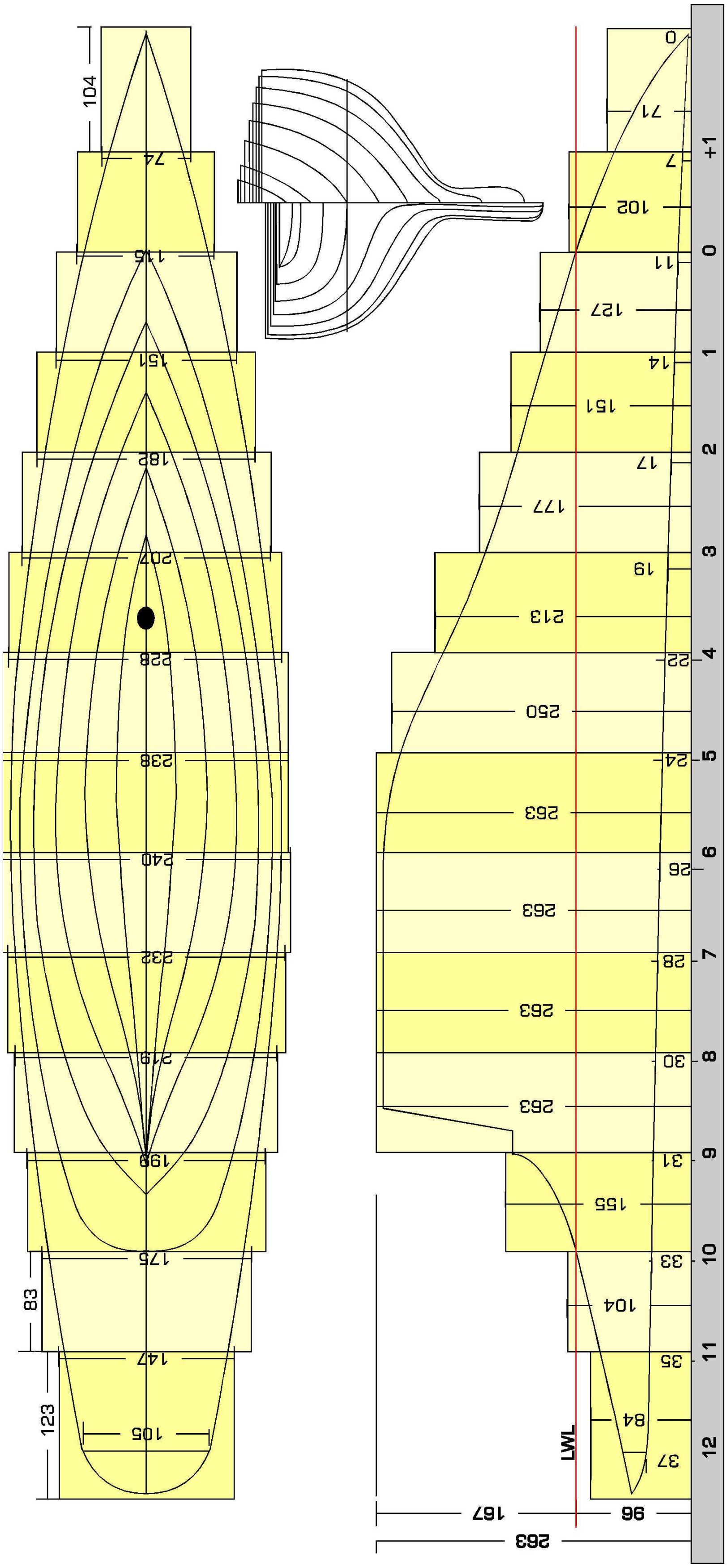
Model dimensions
LOA 1216mm
LWL 833 mm
Beam 223 mm
WBeam 207mm
Draft 163 mm
DSPL 5617 g
Bulb 3360 g
Constr. 2240 g
SA 5950 cm^2
American Eagle
1964
scale 1 : 17
By ClaudioD
AMERICAN EAGLE
Real Dimensions
LOA 68'
LWL 46' 6"
Beam 12' 6"
Draft 9' 3/4
DSPL 23.35 T
SA 1850 sqFt
93
1216
833
163
735
223
207

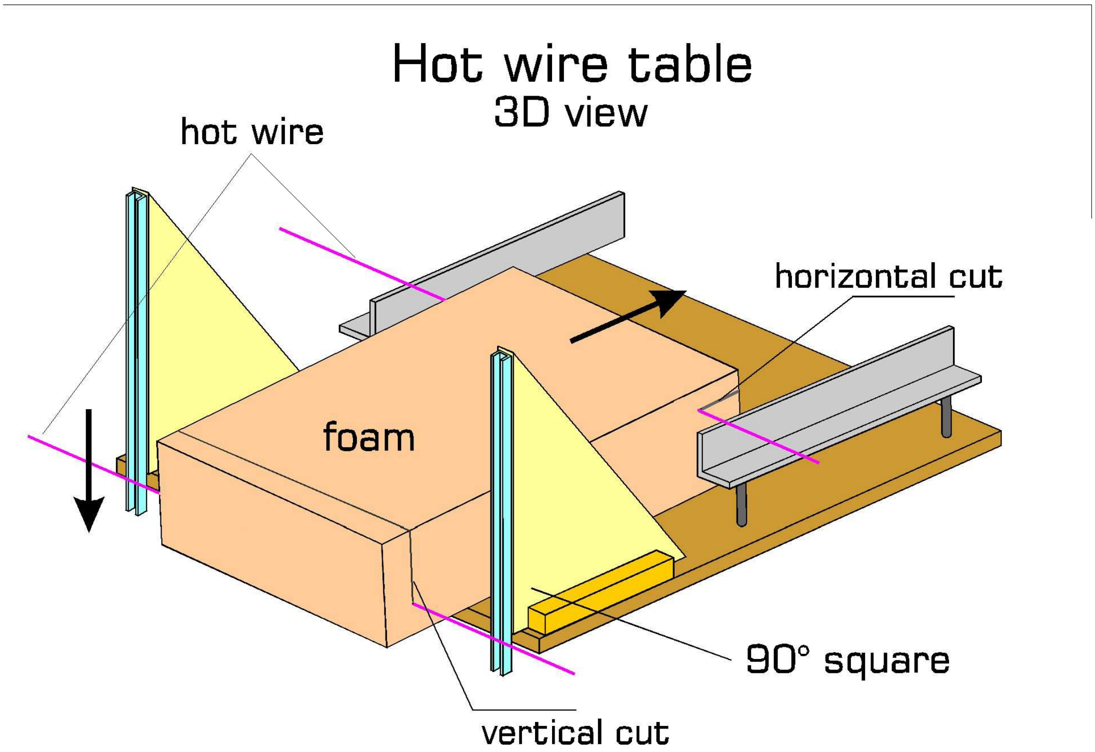
Sail Plan of 6150 cm²



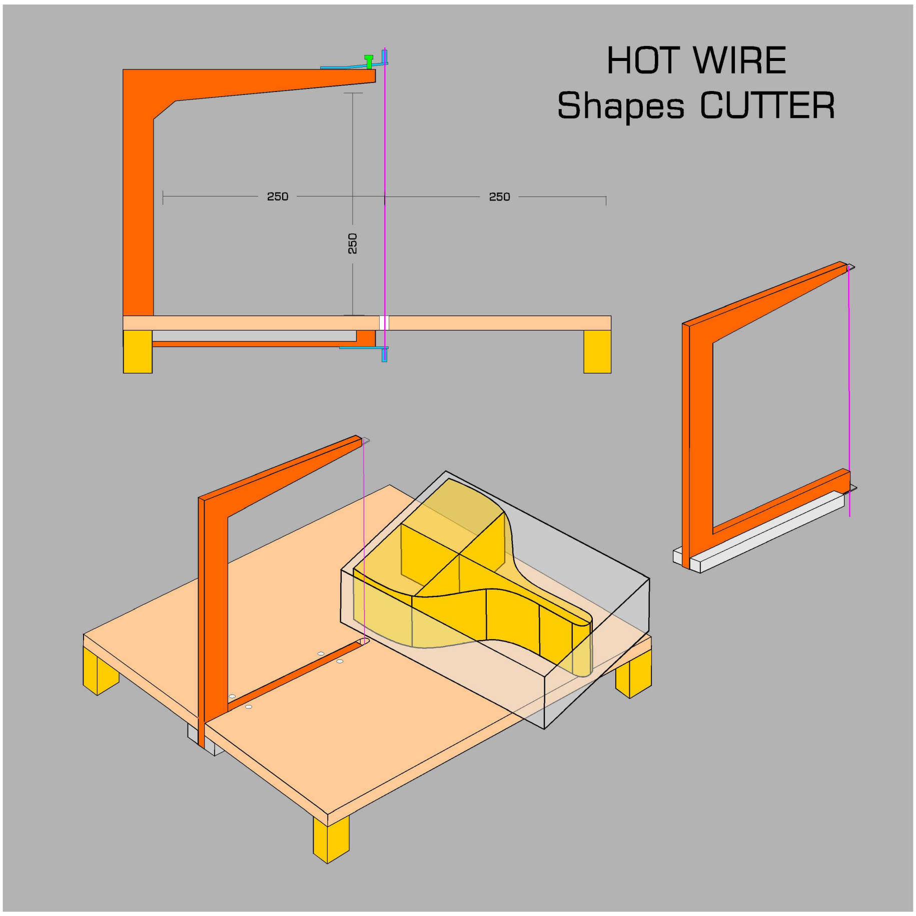
The Construction

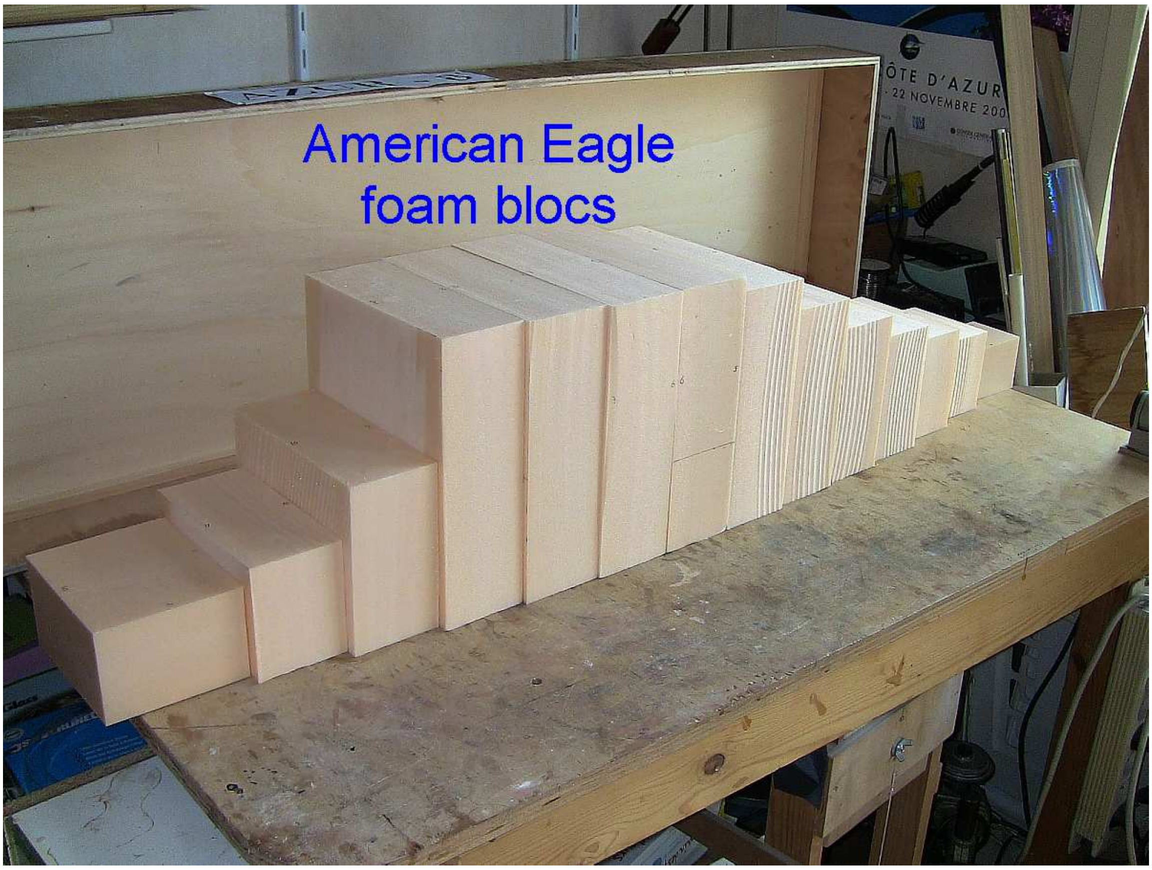
The Master is made with the typical Foam material as the Extruded Polystyrene

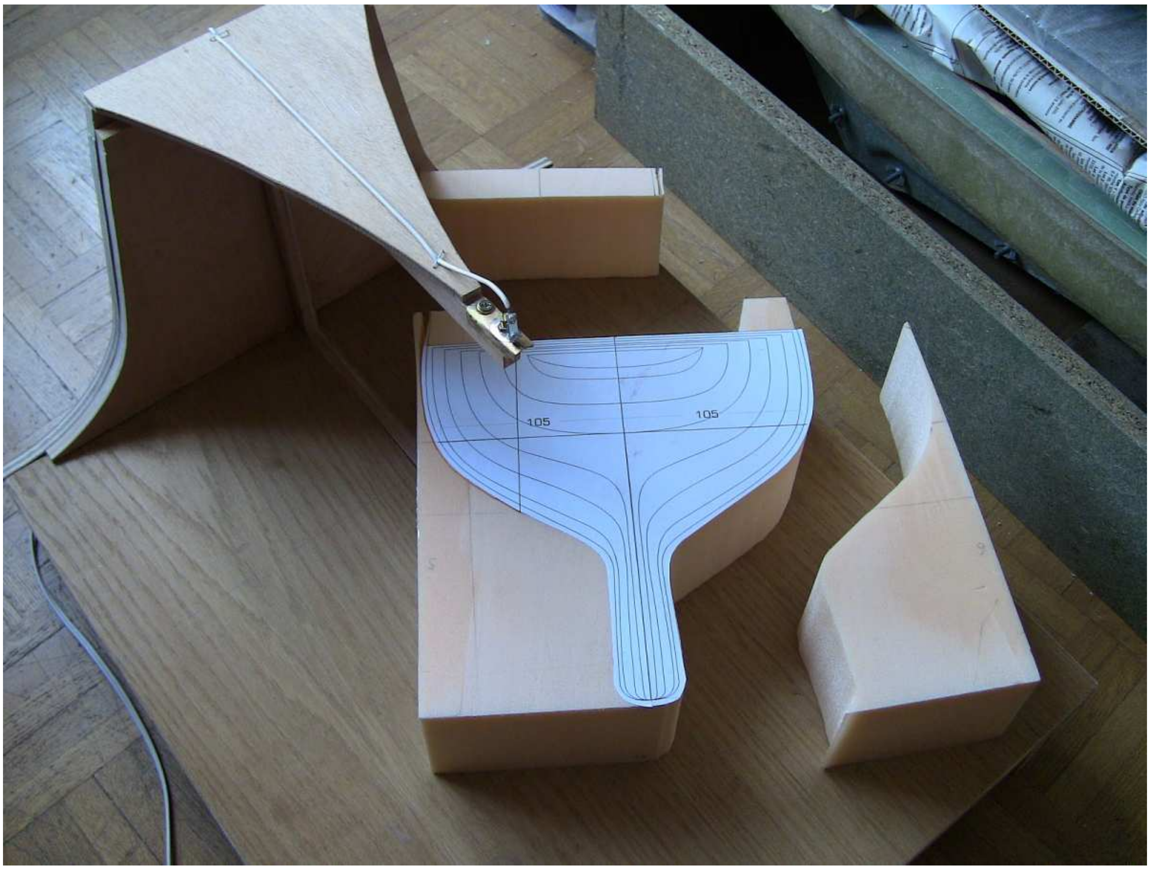




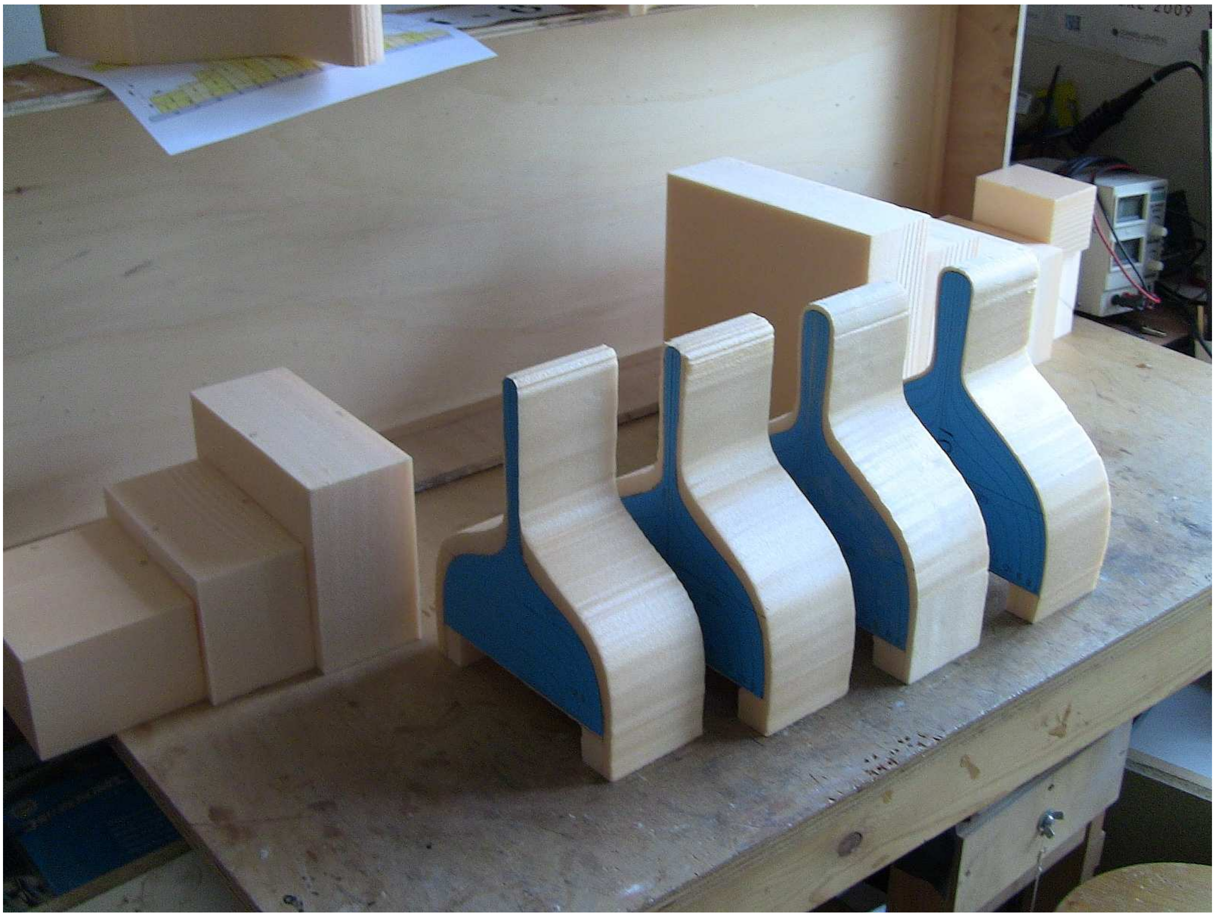
To cut the Foam Blocs I did built a 2 Hotwire cutters, one for rectagular panel and one for curved shape

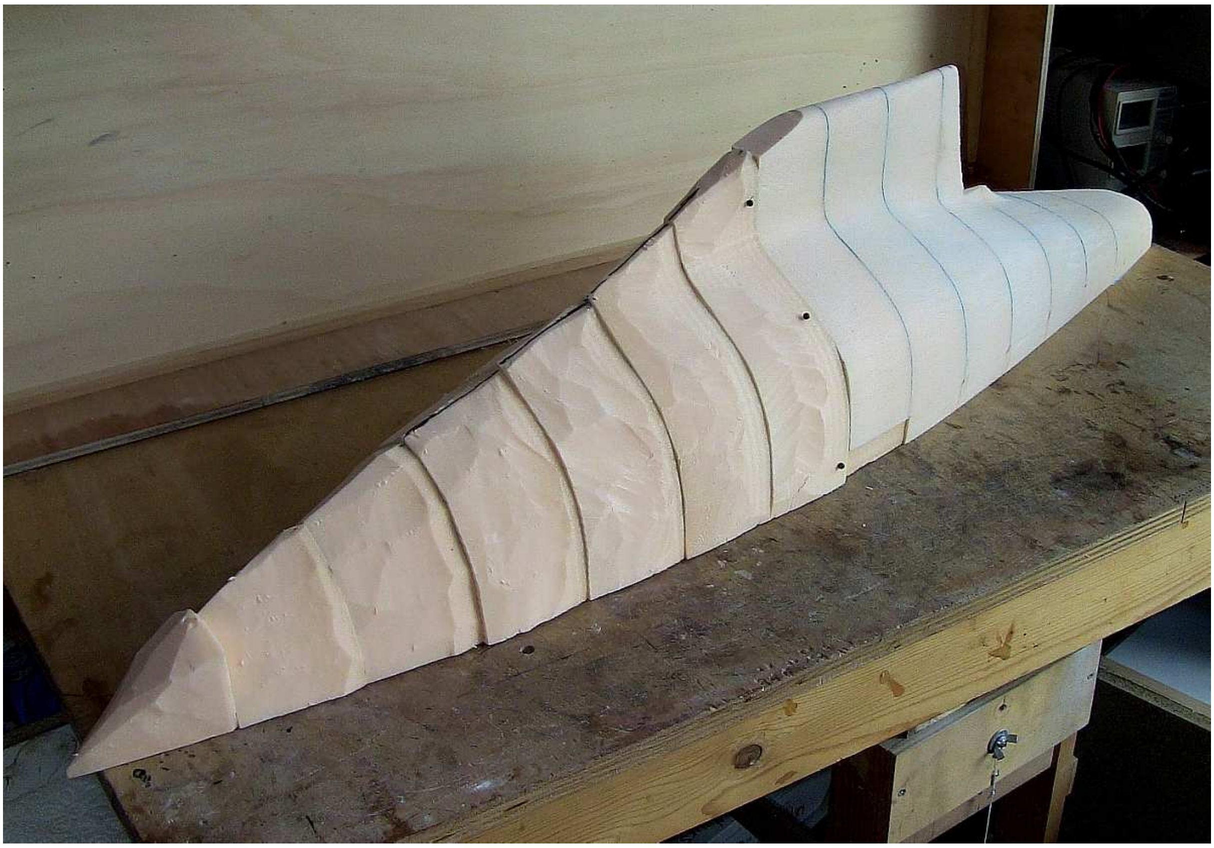


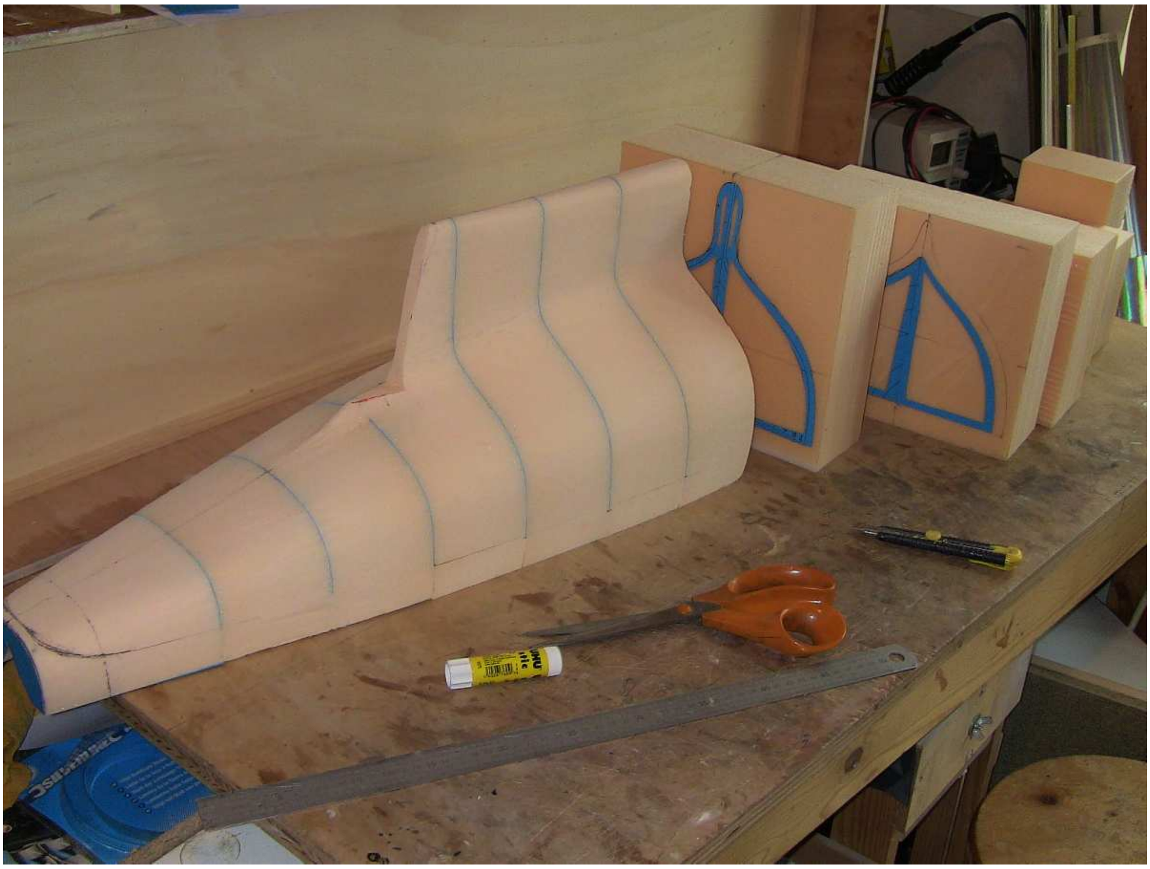




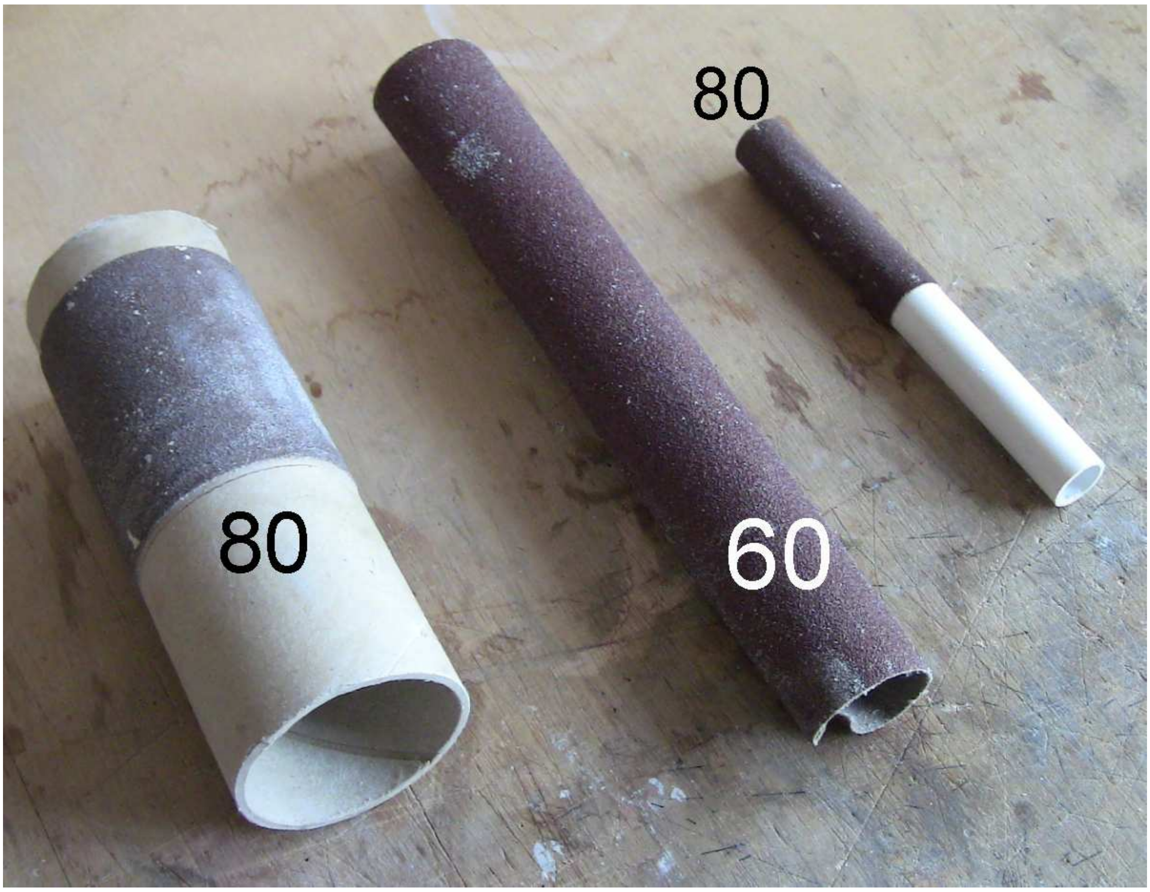
Two examples of cuttings.







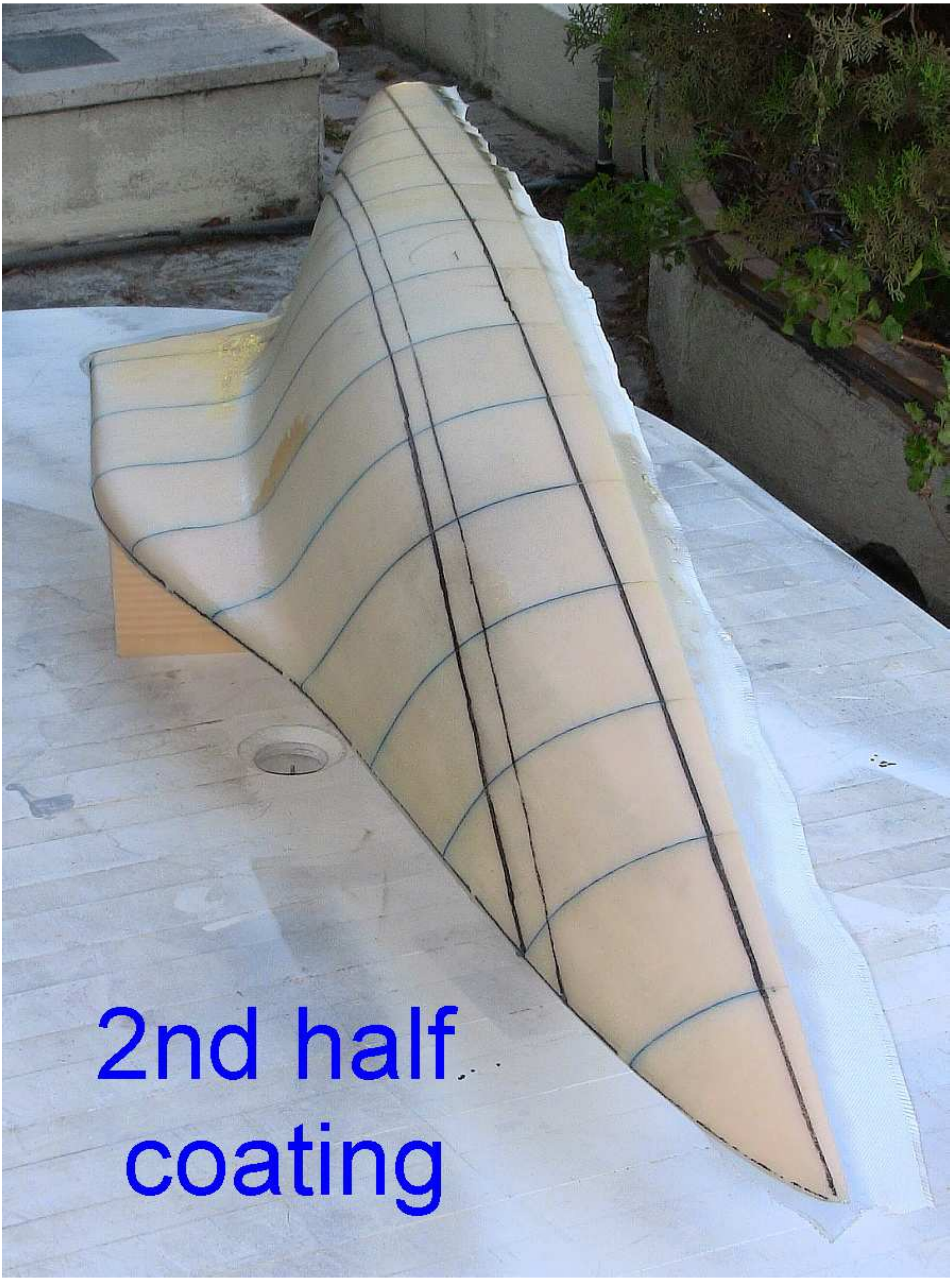
To facilitate the sanding operations I did made a couple of tools



The Foam Master is ready :


POLYPLAN
taffetas verre
162 g/m²
3 m² - larg. 1,00 m


1st glass coat
66g tissue
95g epoxy



Hull Coated with 2 Epoxy-Glass layers

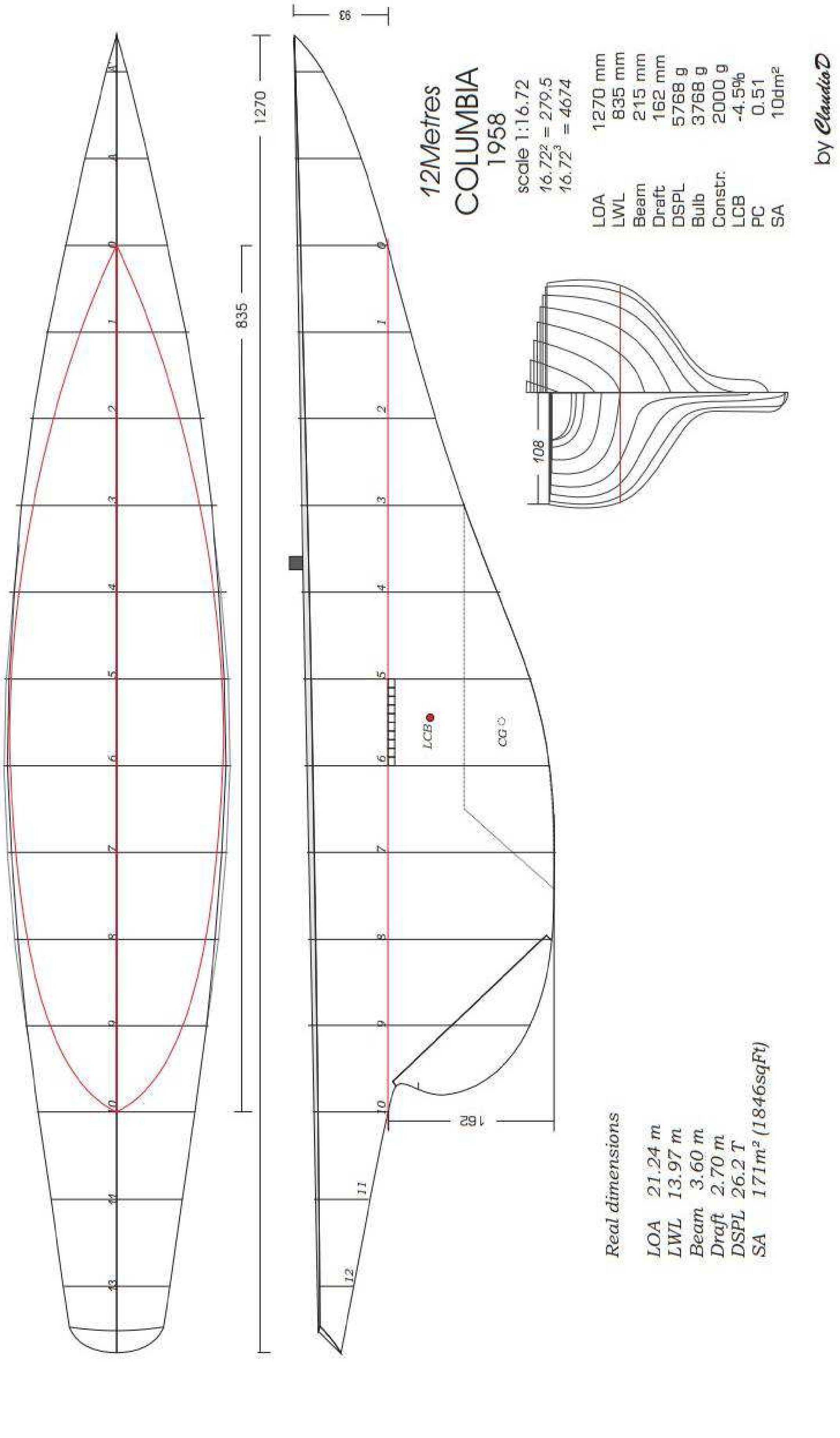
The Hull is covered with Packing Tape as done all the times.
In this case a little problem arise due to lack of adhesion in the concave corner

Packing Tape poor adhesion effect !

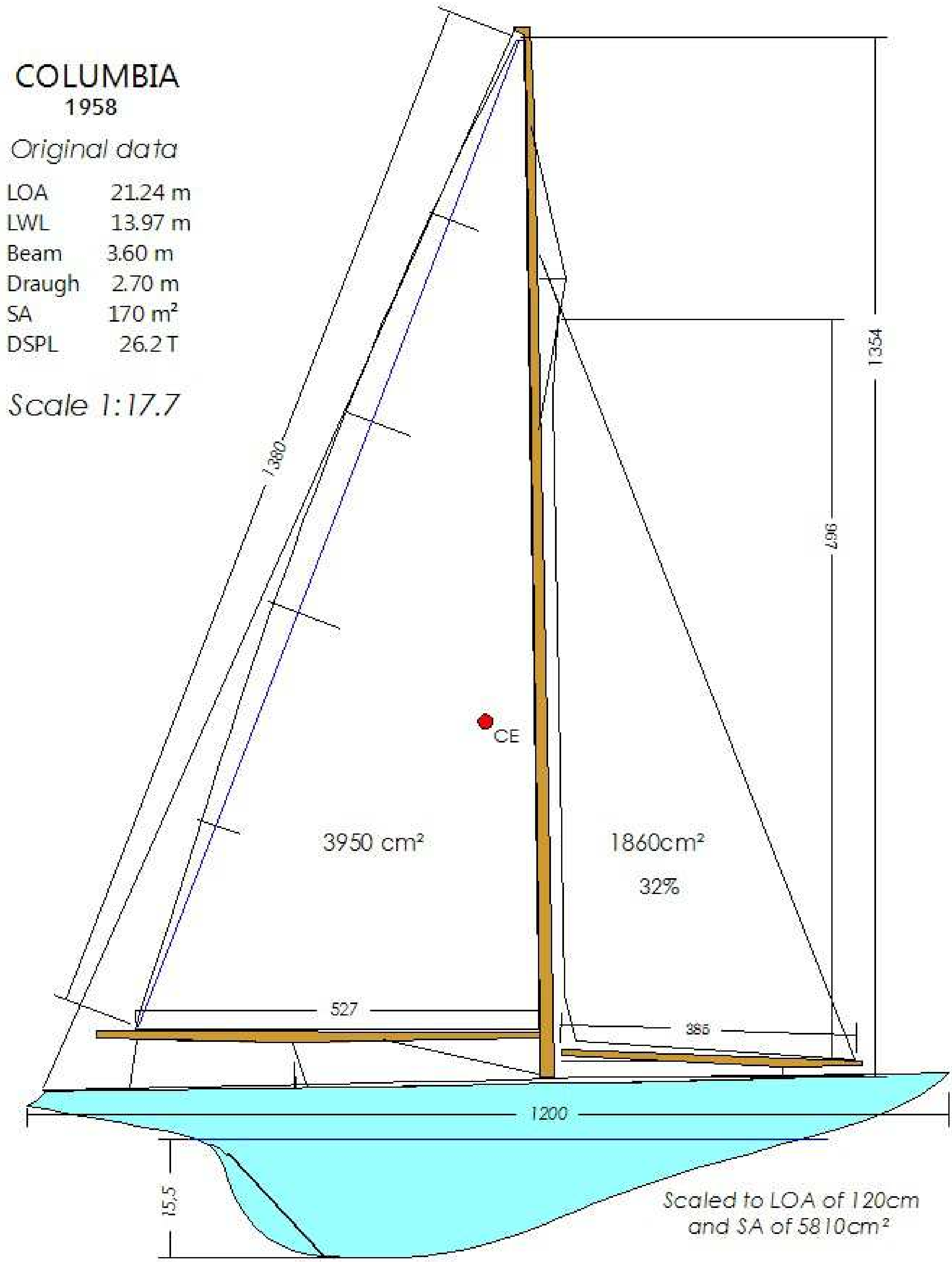
The white paint is used as a "spy" to control the surface status during sanding.

Ready for Hull Moulding

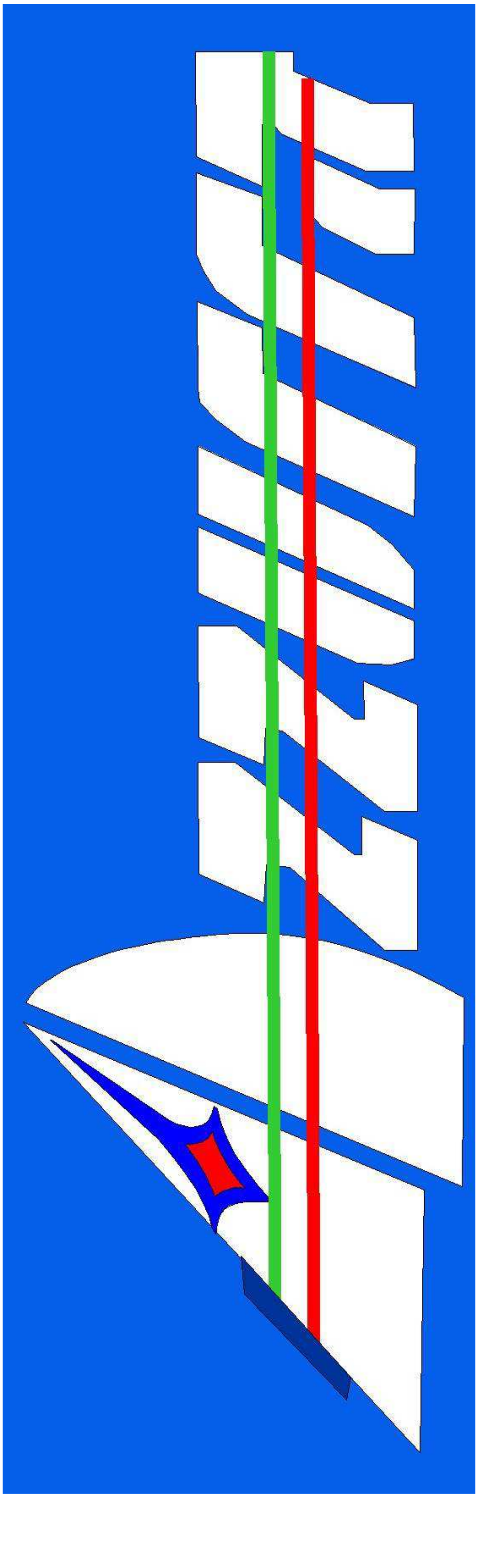
Columbia 1958

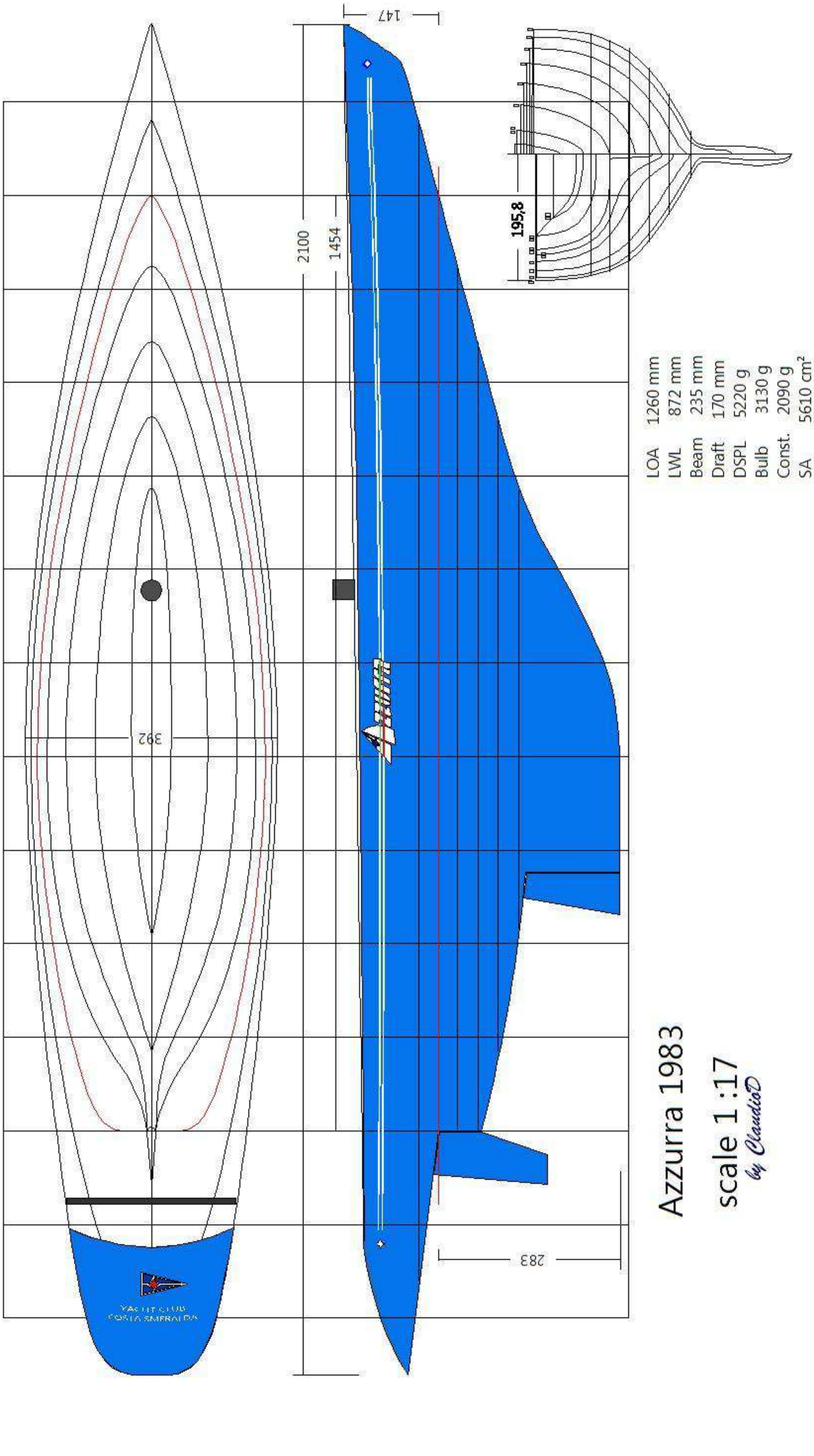


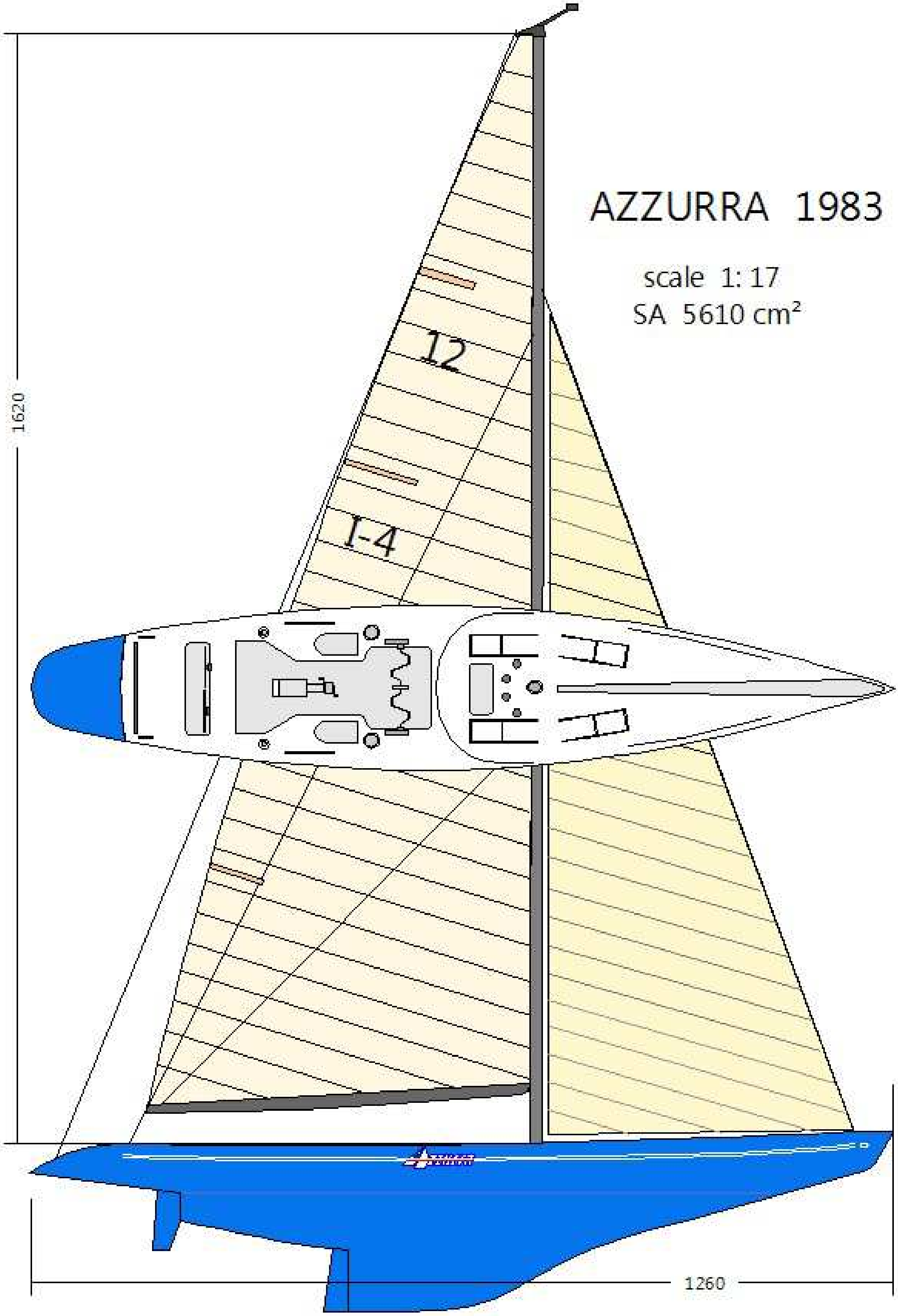
Columbia 12 metre Class was made in 1958.



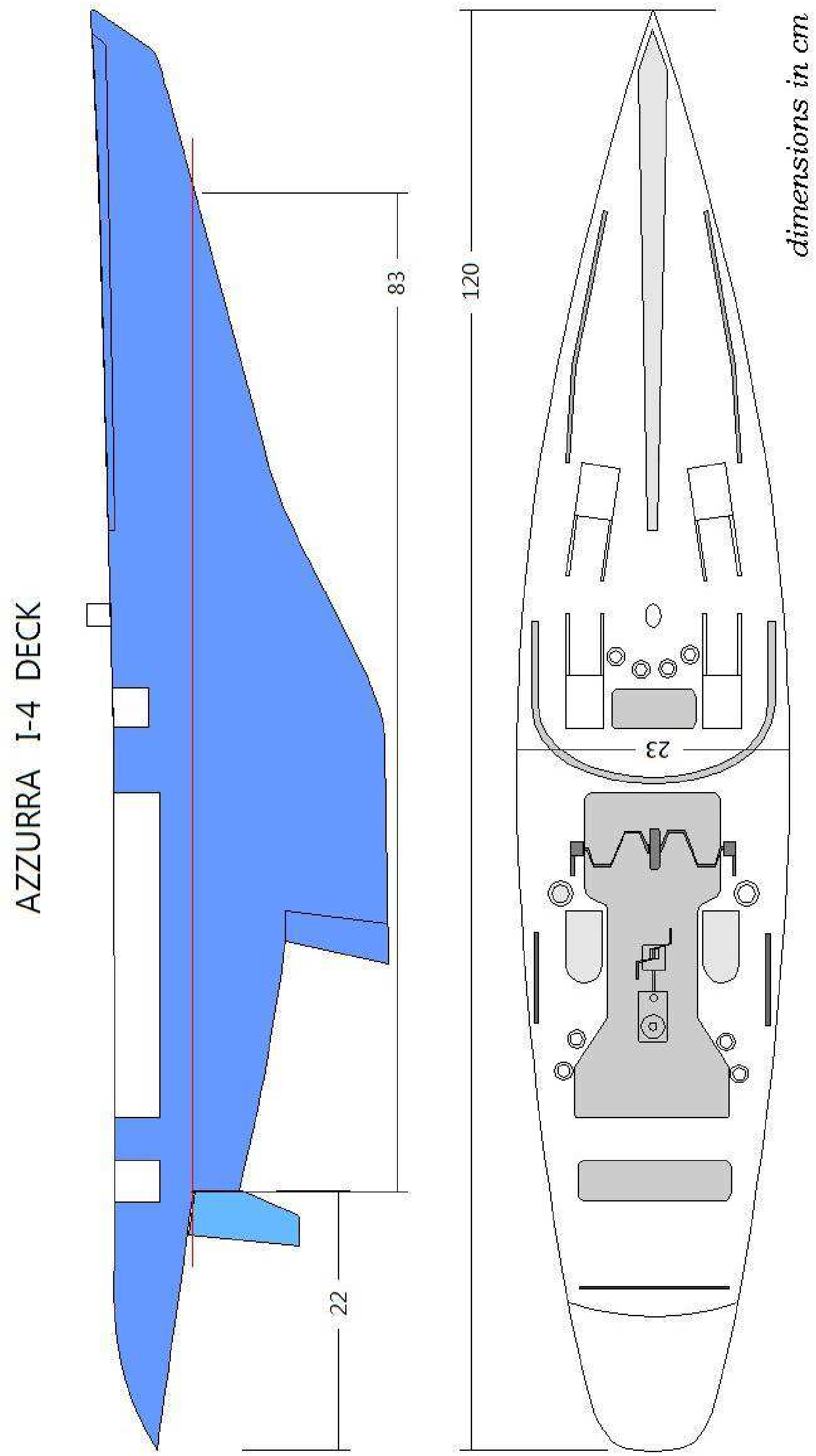
Azzurra 1983




Azzurra 1983
scale 1:17
by ClaudioD
LOA 1260 mm
LWL 872 mm
Beam 235 mm
Draft 170 mm
DSPL 5220 g
Bulb 3130 g
Const. 2090 g
SA 5610 cm²
2100
1454
392
147
283
195,8
YACHT CLUB
COSTA SMERALDA


AZZURRA 1983
scale 1: 17
SA 5610 cm²
12
I-4
1620
1260

Deck layout



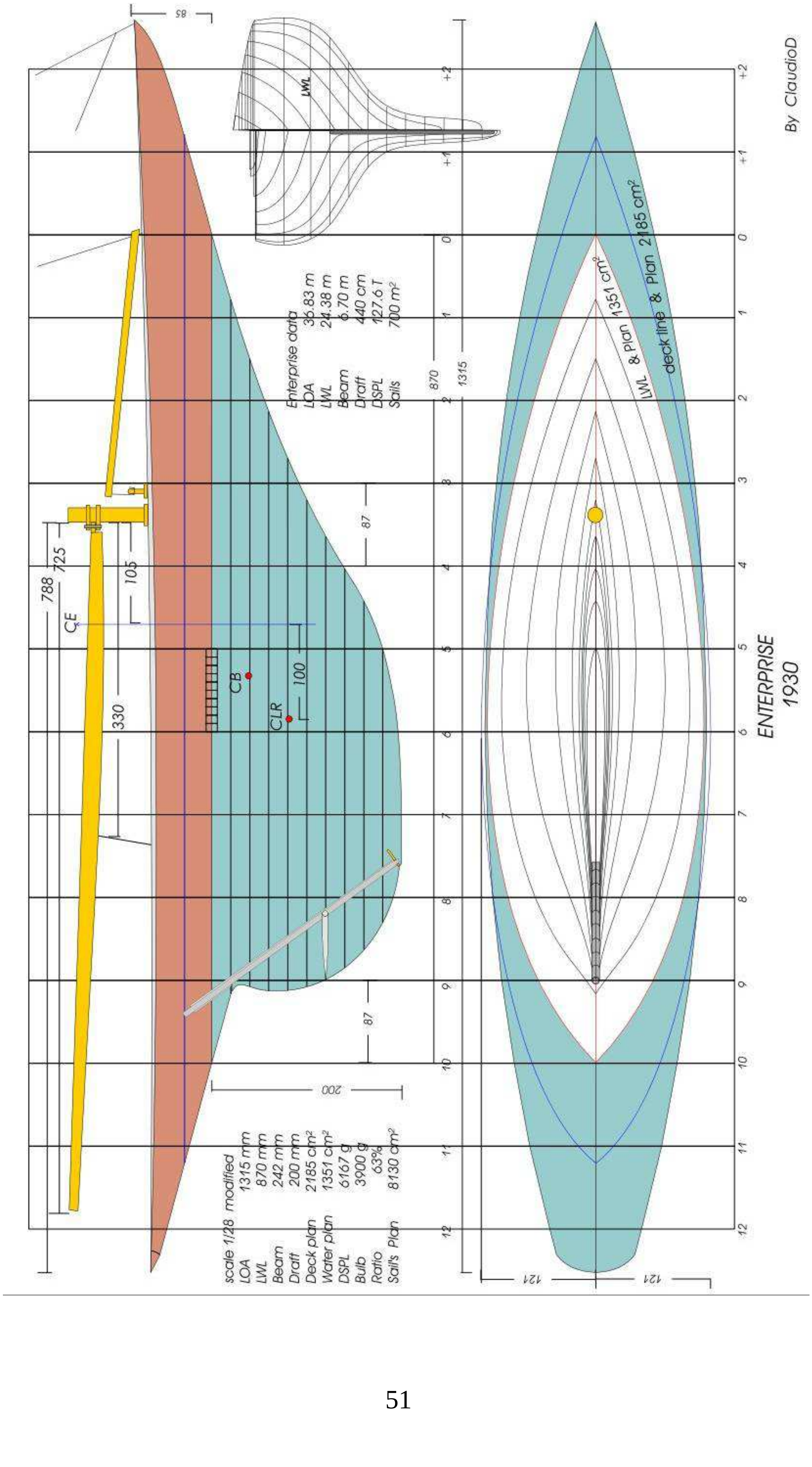
J Class

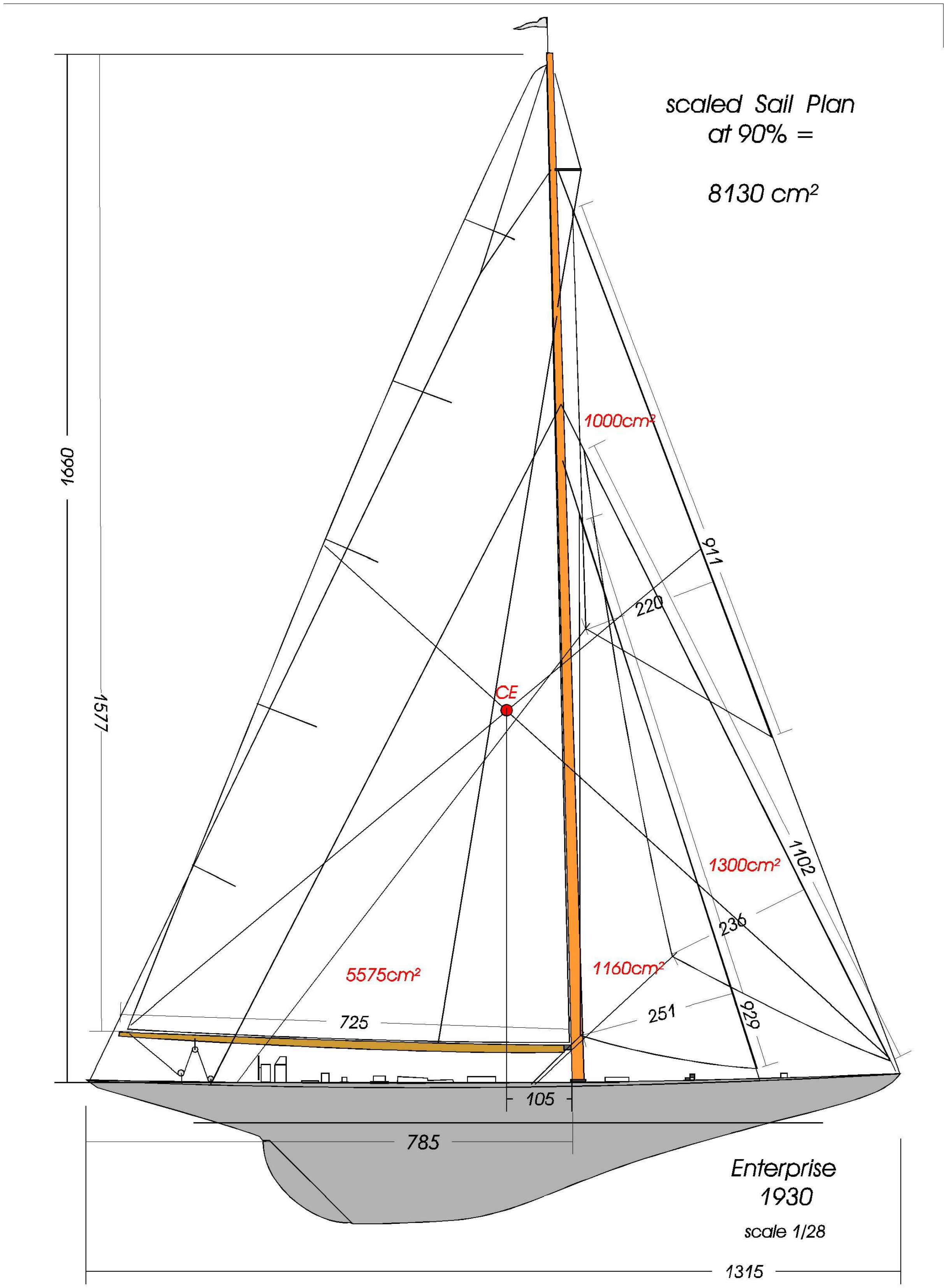
I have drawn years ago the Plans for a couple of J Class.
The first was the Enterprise that I built and the second, the Endeavour, I made only the Plans.

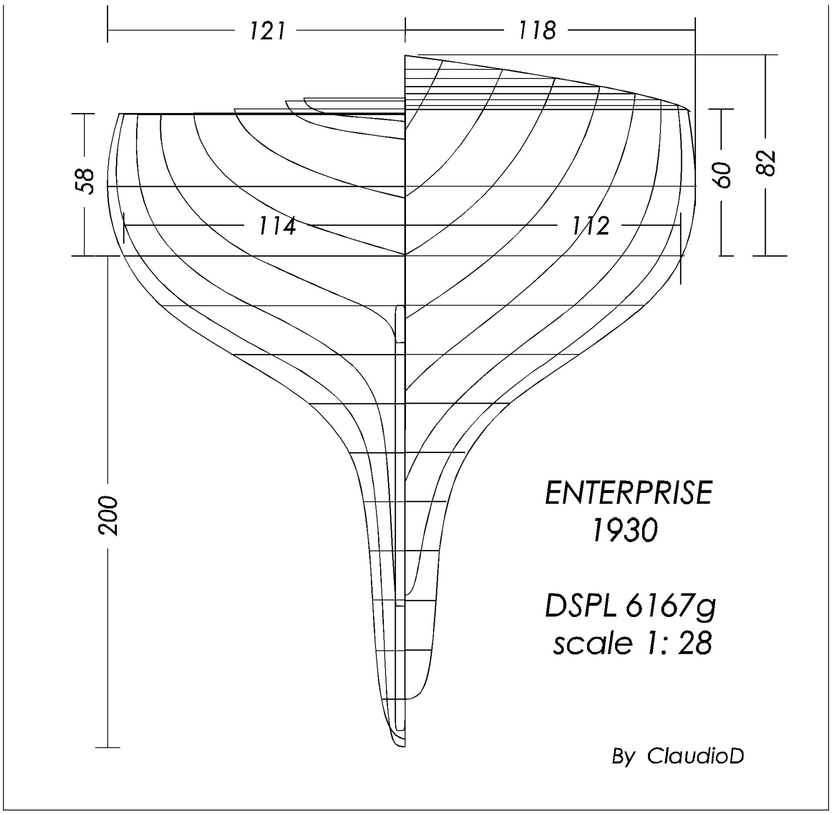
1. **Enterprise**
2. **Endeavour**
3. **Ranger**

ENTERPRISE

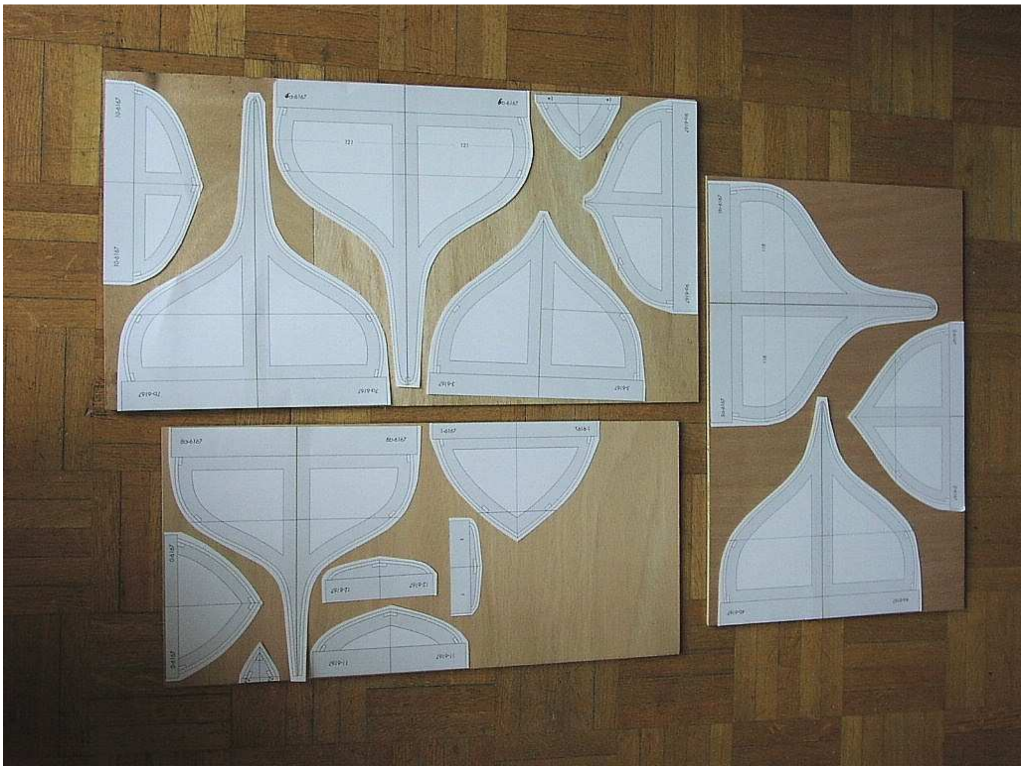
The presentation of the Enterprise RC Model will be a sort of "Build Log"




scaled Sail Plan
at 90% =
8130 cm²
1000cm²
911
220
CE
1577
1660
1300cm²
1102
236
5575cm²
1160cm²
251
929
725
105
785
Enterprise
1930
scale 1/28
1315



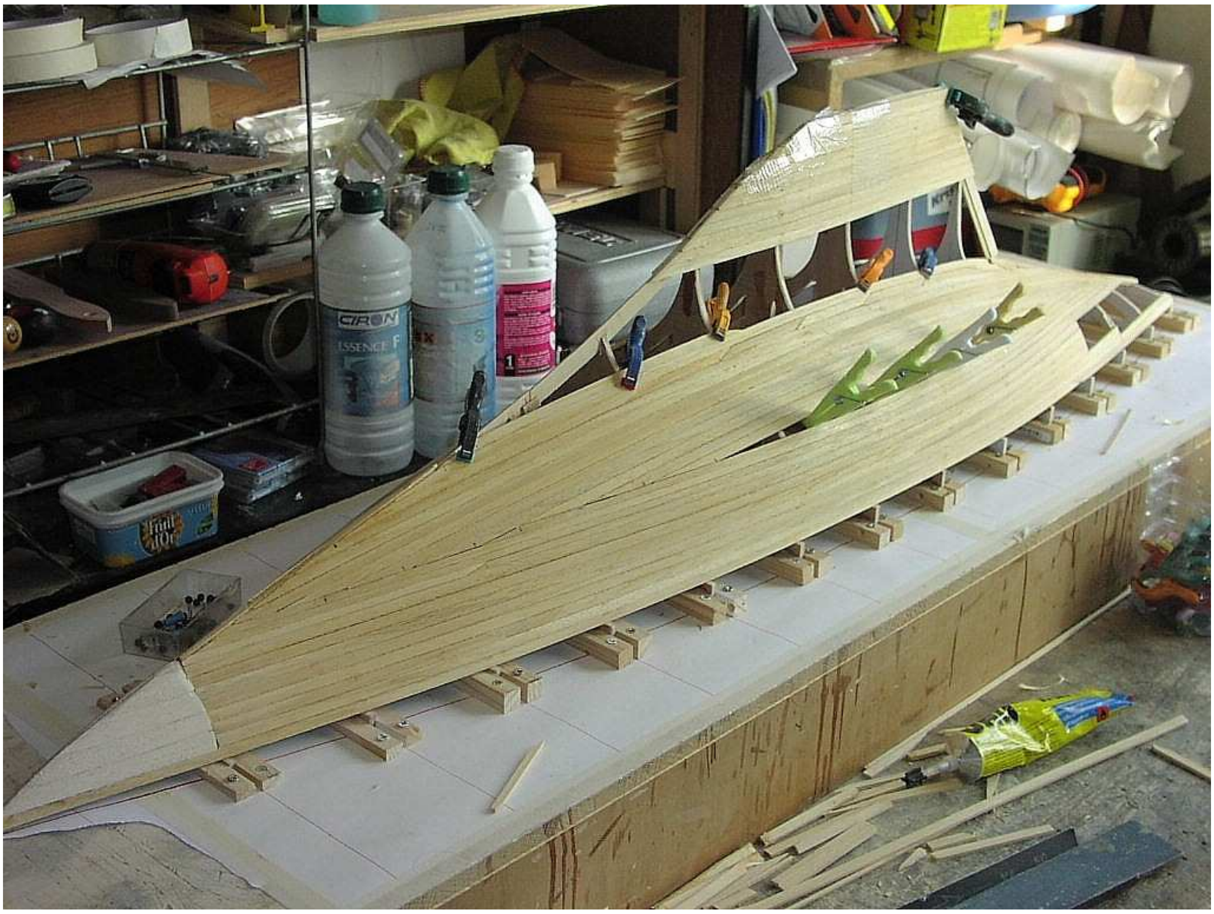
Shadows on 5mm Plywood ready for cutout

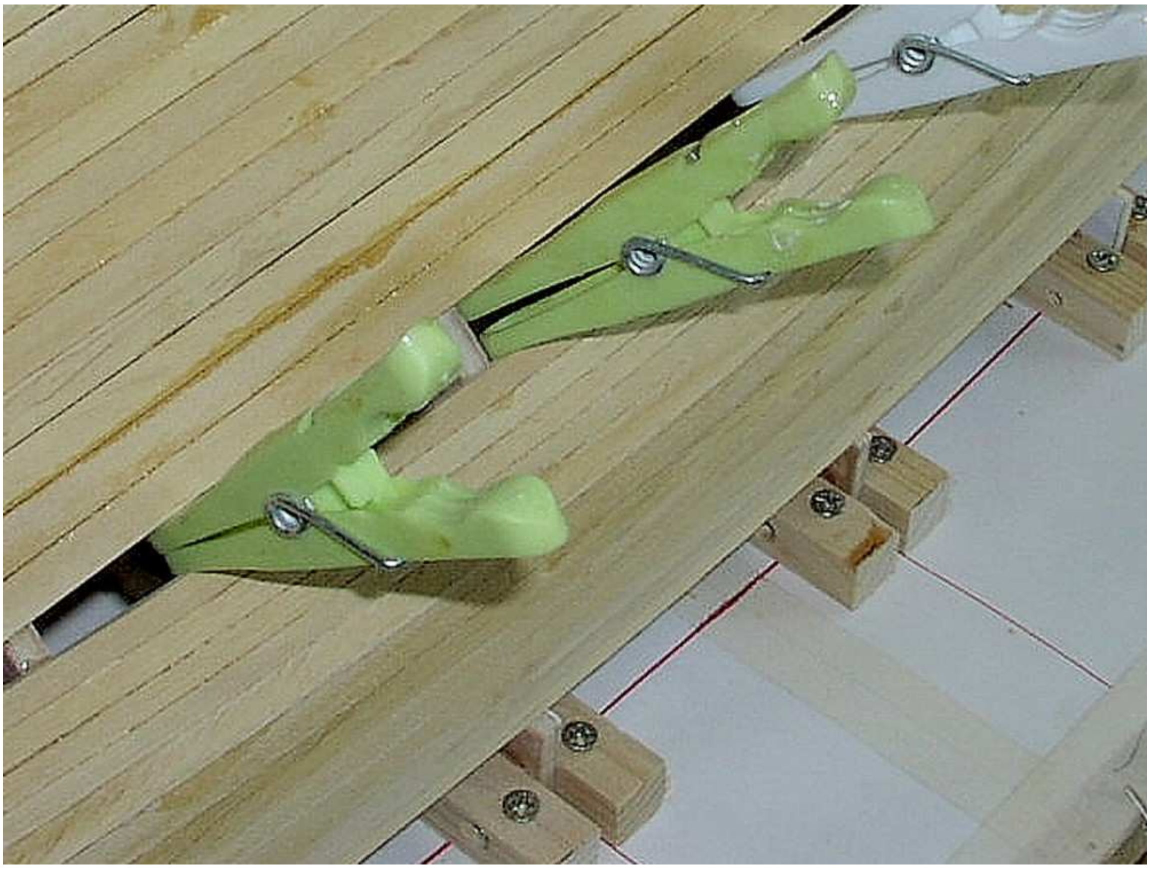


Mounting Table

Shadows in place

Samba/Obeche lamination stripes





Simple tooling !

Hull Master completed

Hull Shadows cut-out

Hull coated before wet sanding

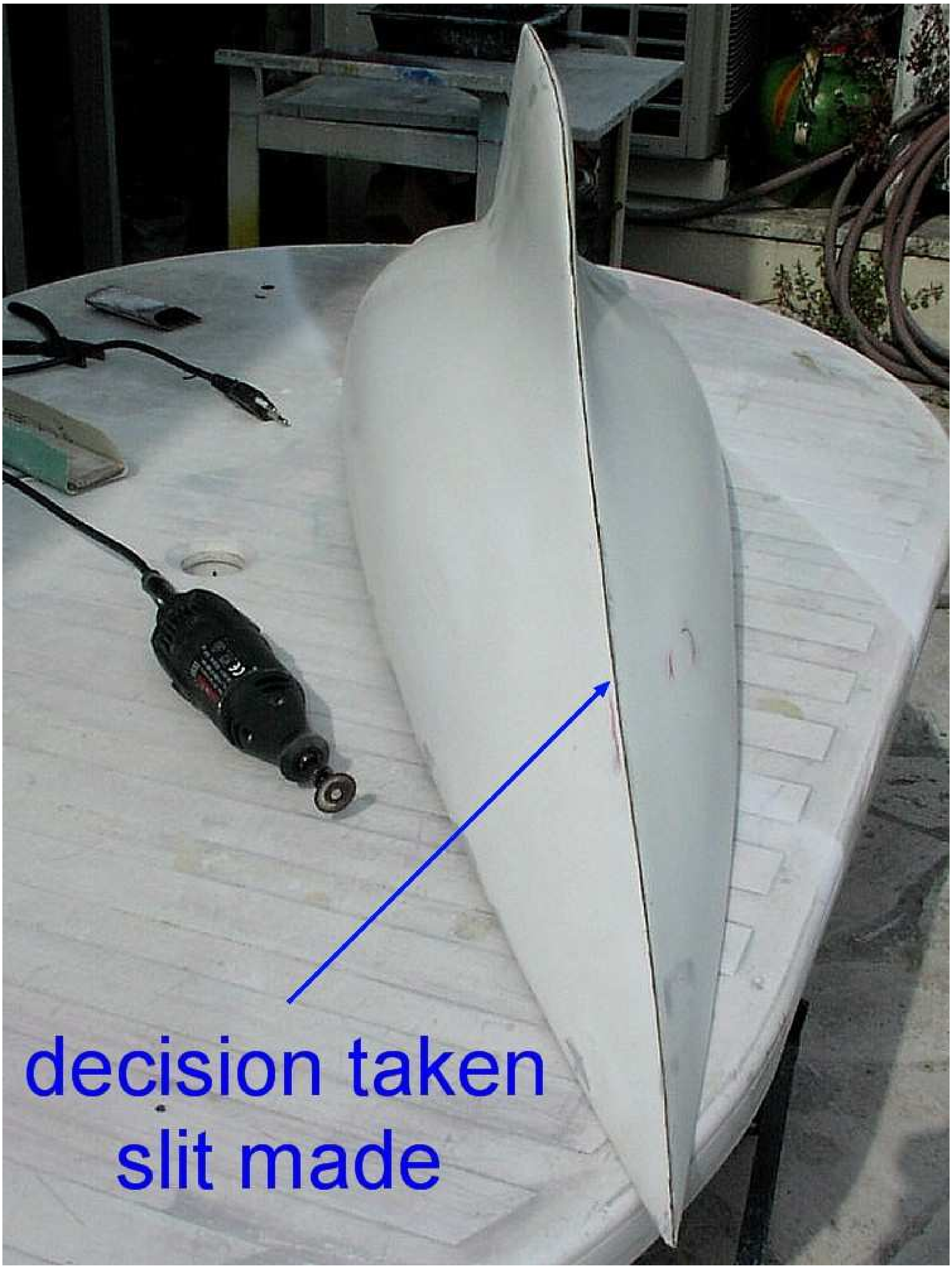
Before cutting glass fibre tissue a template is made with Newspaper


glass tissue template

Half Hull laminated


plug laminated

Template for profile control and primer use



Along the Keel a slit is cut in order to insert a wedge

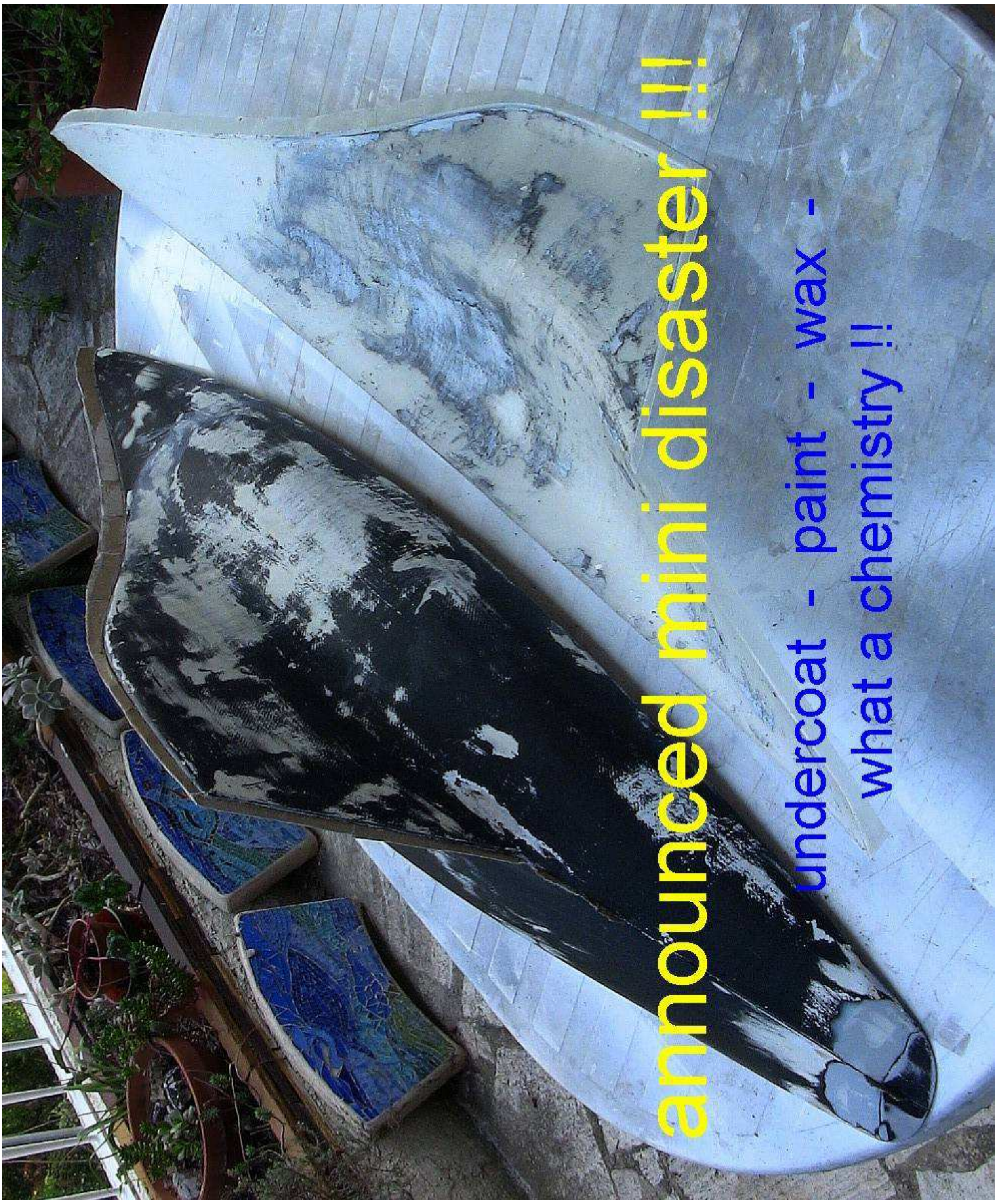
The Hull is Black painted.
The Black paint is used as a "spy" during wet sanding

After "Wet Sanding" the carton wedge is inserted


1st half coating
< 3 glass layers of 80g/m^2

After lamination Peel ply tissue is used to absorb the Epoxy resin excess

This failure was not in the agenda !!!



Outside view

New solution needed !


gross weight
1/2 hull
5 kg
147

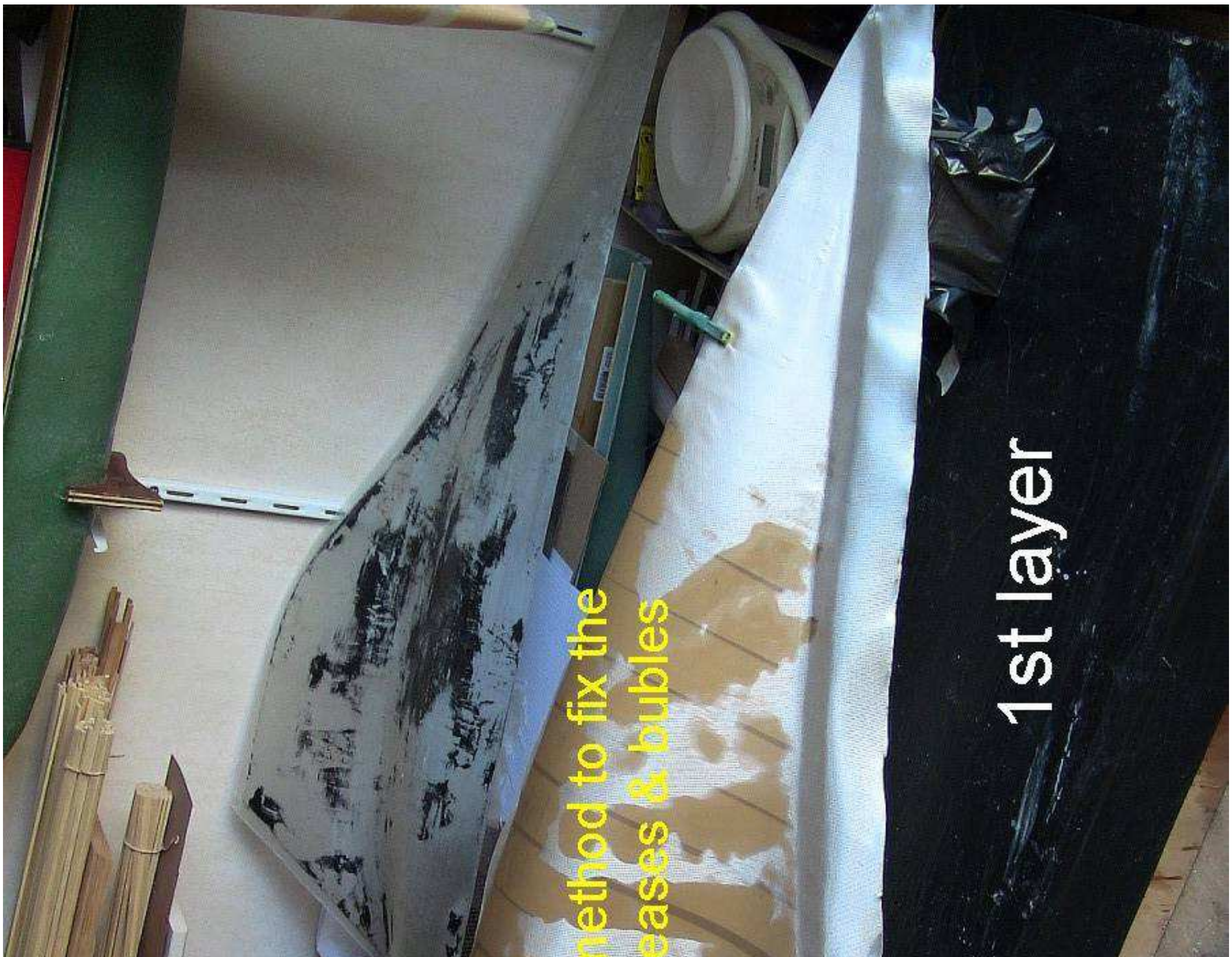

black paint
removed

The magic tape solution !

Was so simple; why not done before?

It look much better !

Preparing for lamination

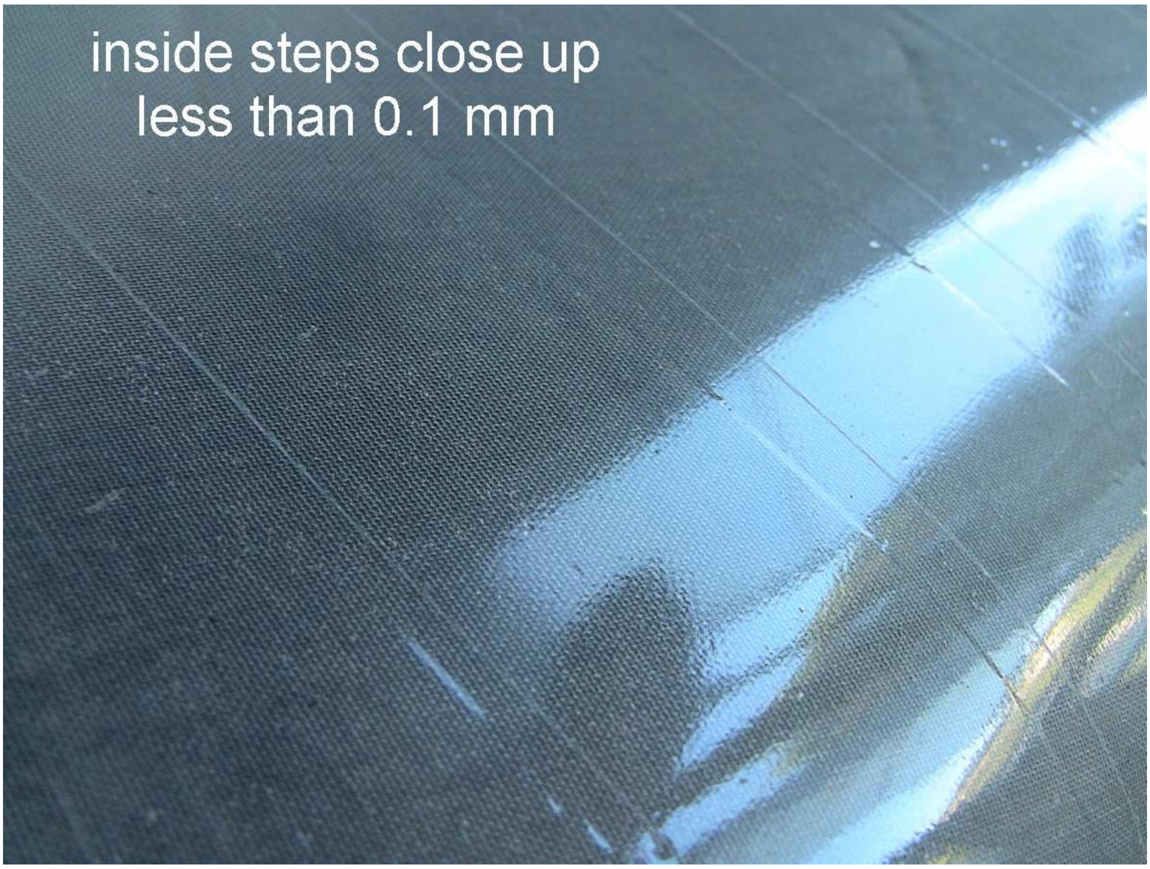

this is my starting method to fix the
tissue and avoid creases & bubles
1st layer

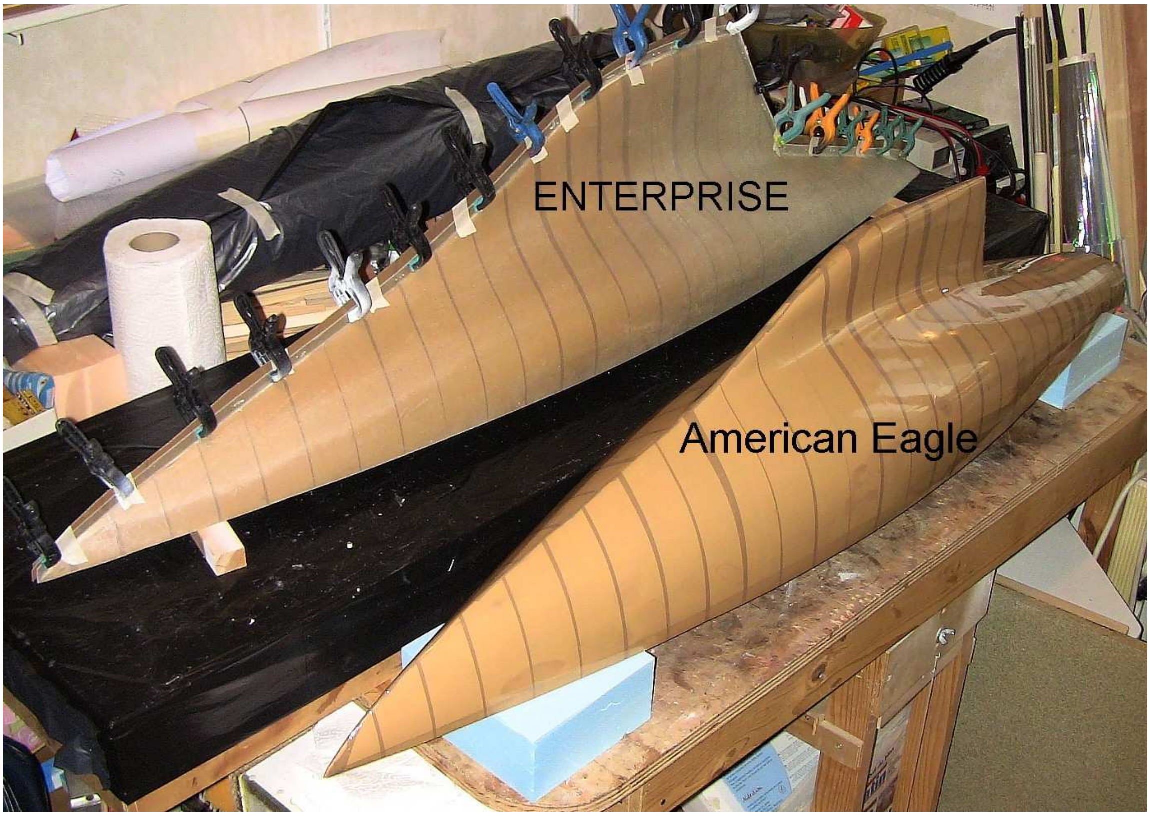

scraped
all layers wet on wet


peel ply ribbons


half hull de-molded

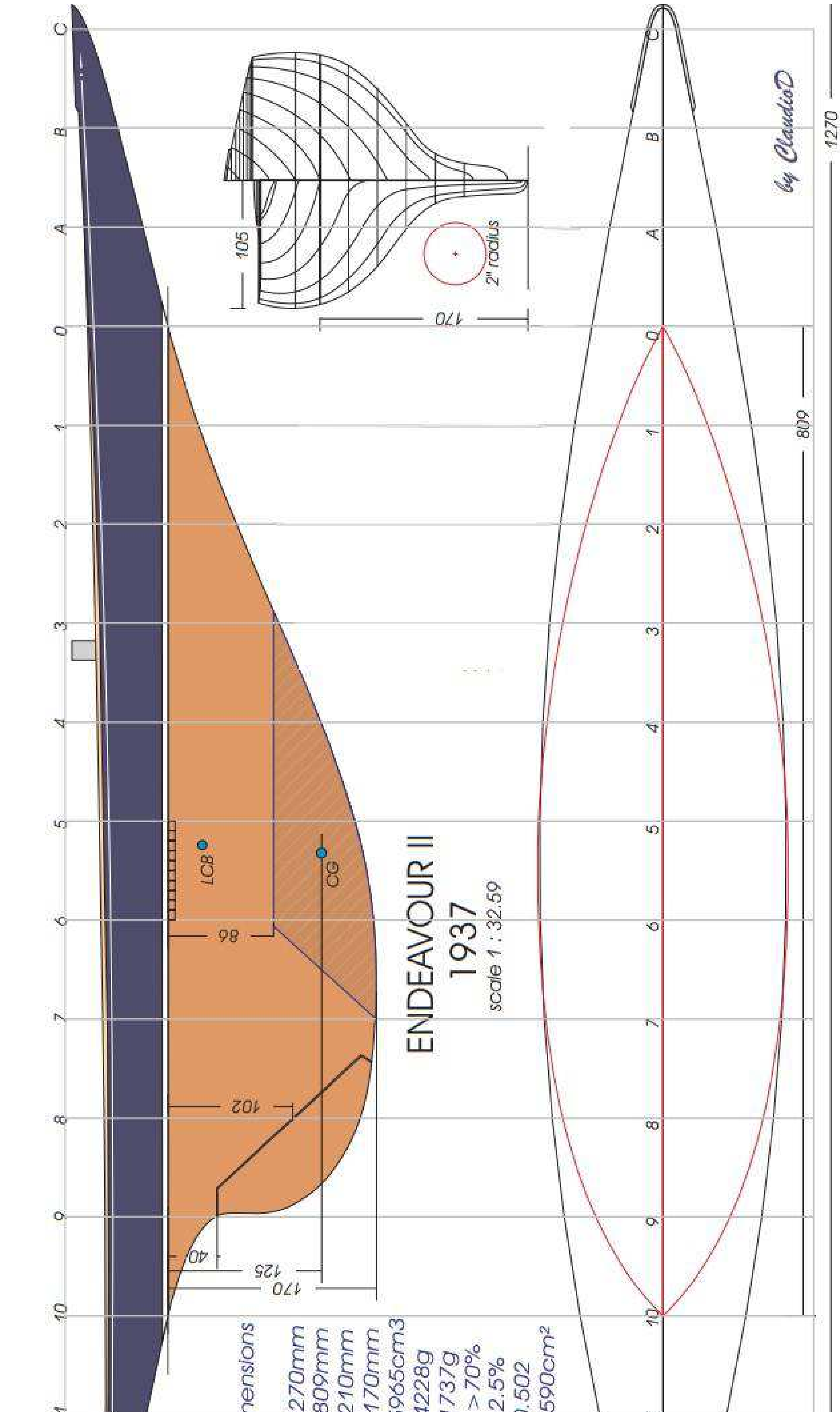
½ hull 148g before edges cutout



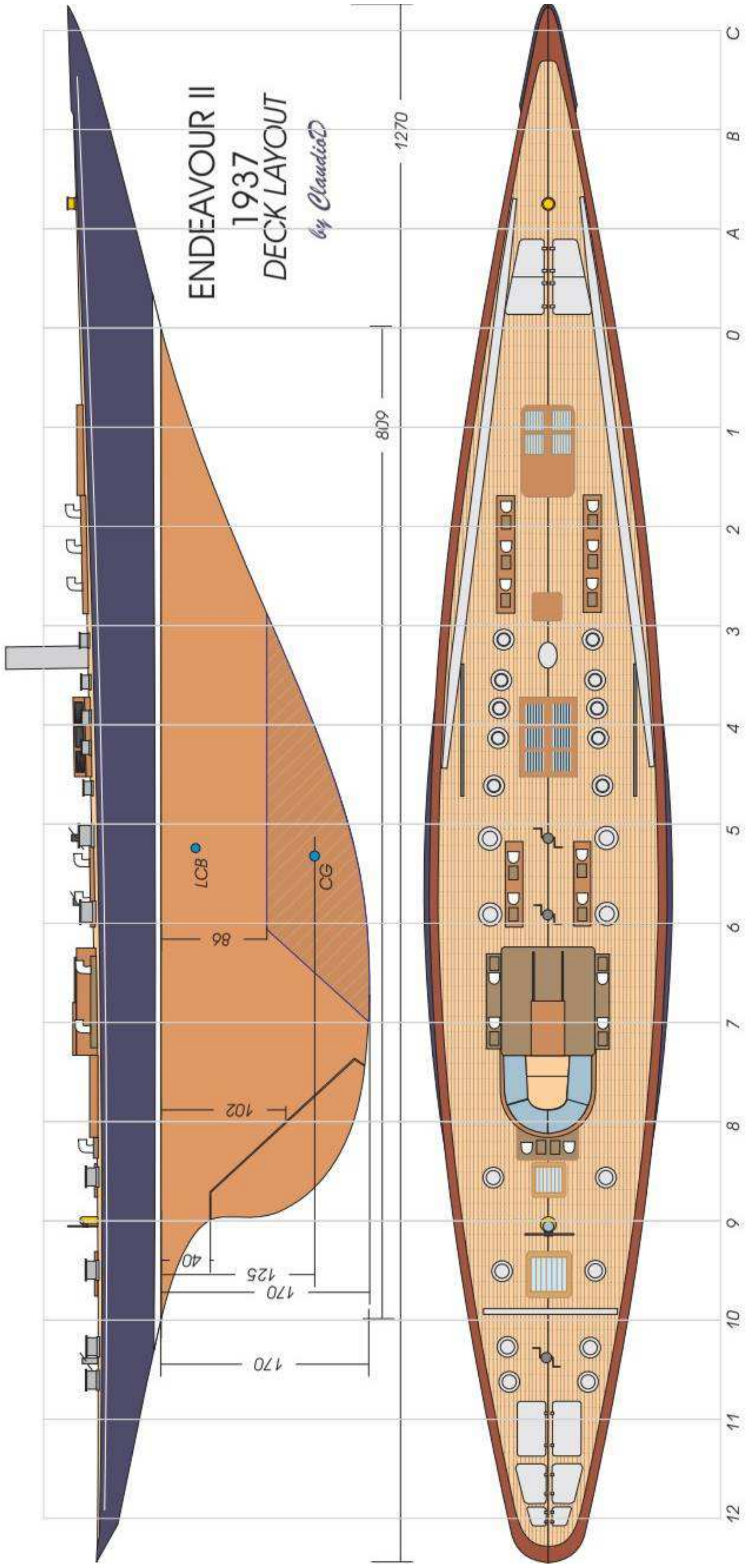


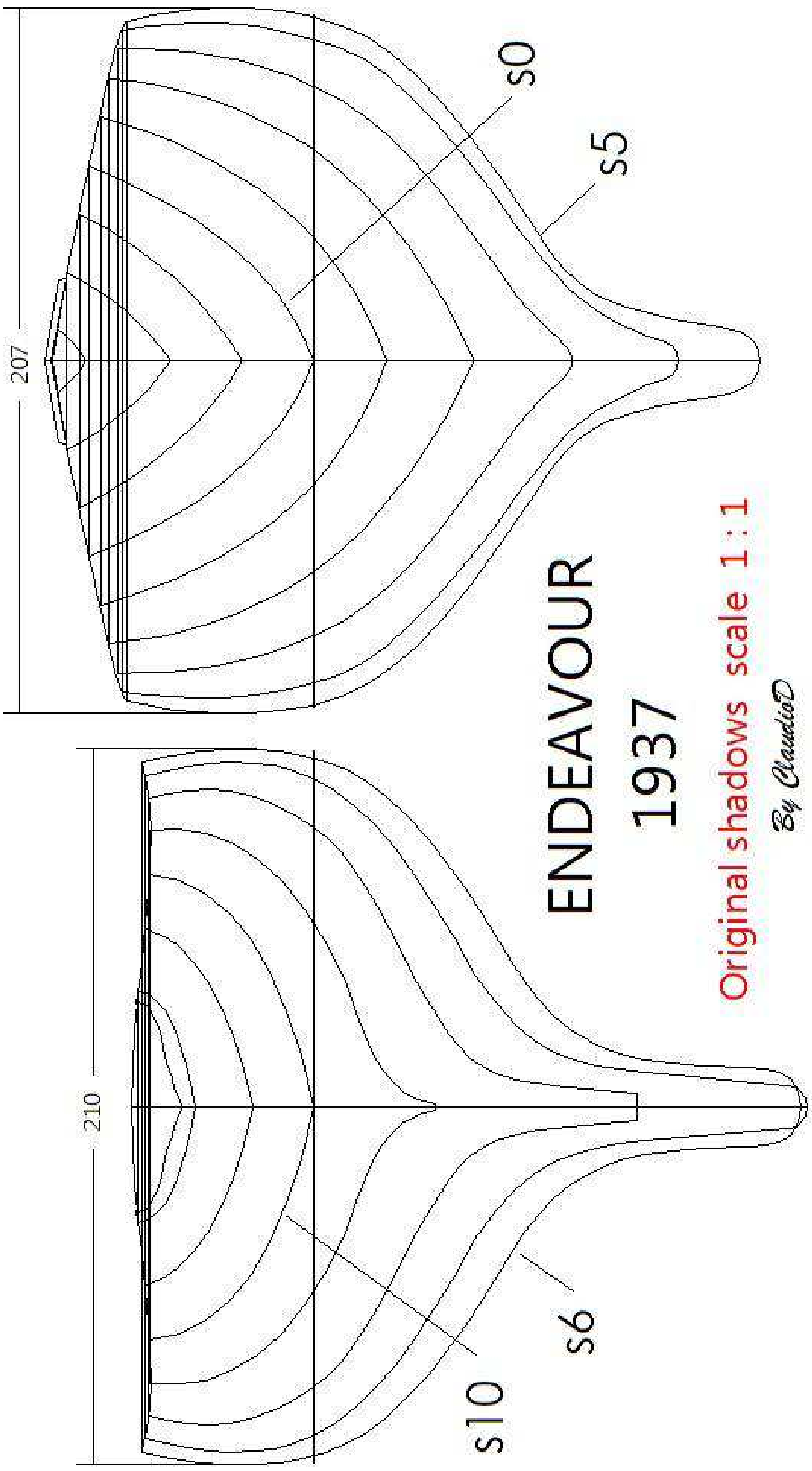
End of Process waiting further work

ENDEAVOUR II (basic drawing for LOA of 1270mm)

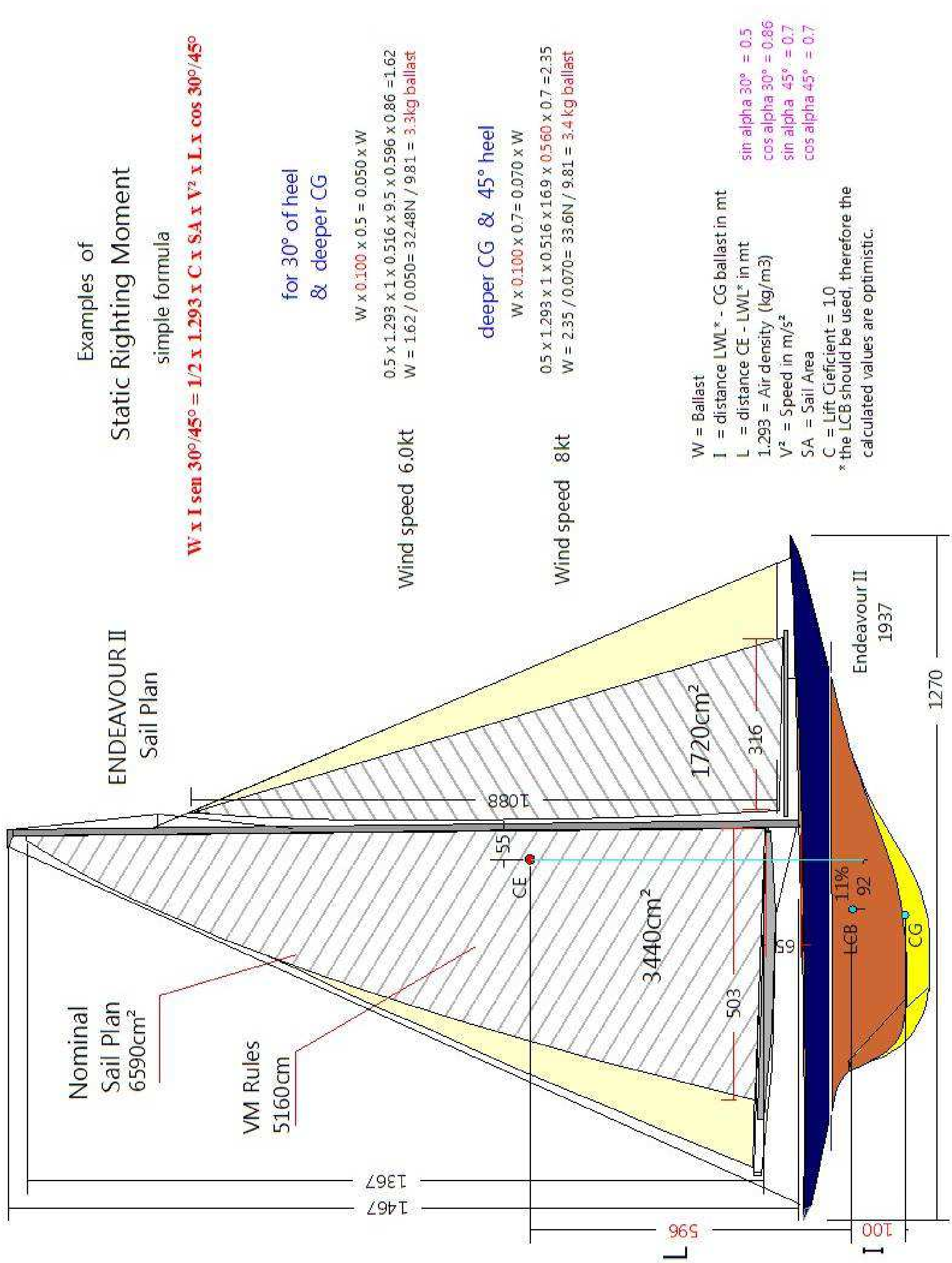


Deck layout

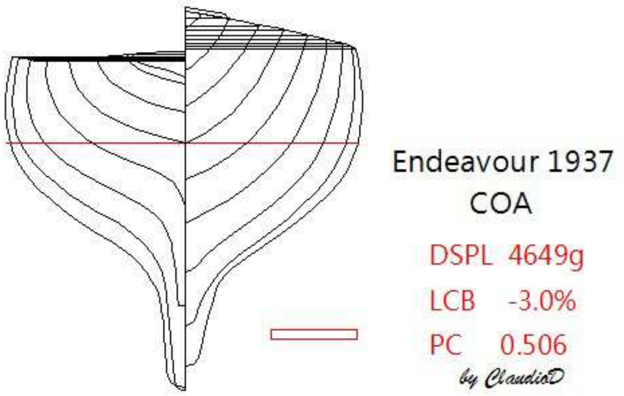

ENDEAVOUR II
1937
DECK LAYOUT
by ClaudioD
1270
809
LCB
CG
98
102
40
125
170
170
C
B
A
0
1
2
3
4
5
6
7
8
9
10
11
12

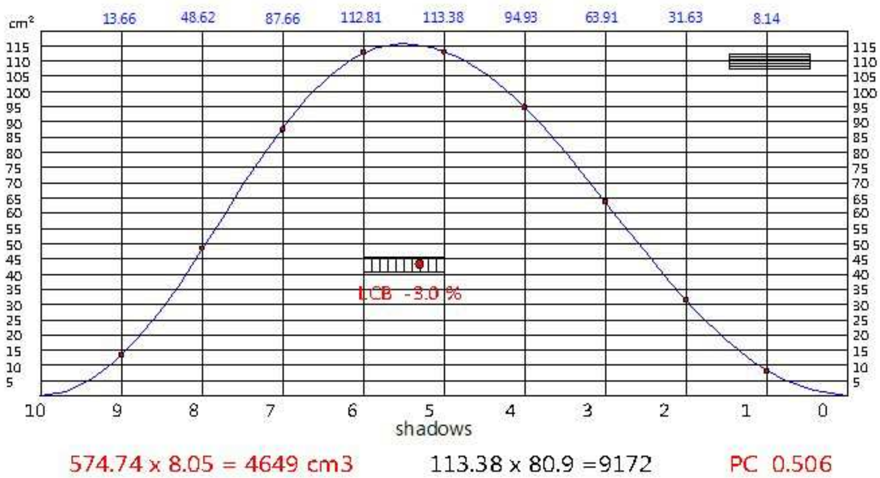

207
s0
s5
210
s6
s10
ENDEAVOUR
1937
Original shadows scale 1 : 1
By ClaudioD

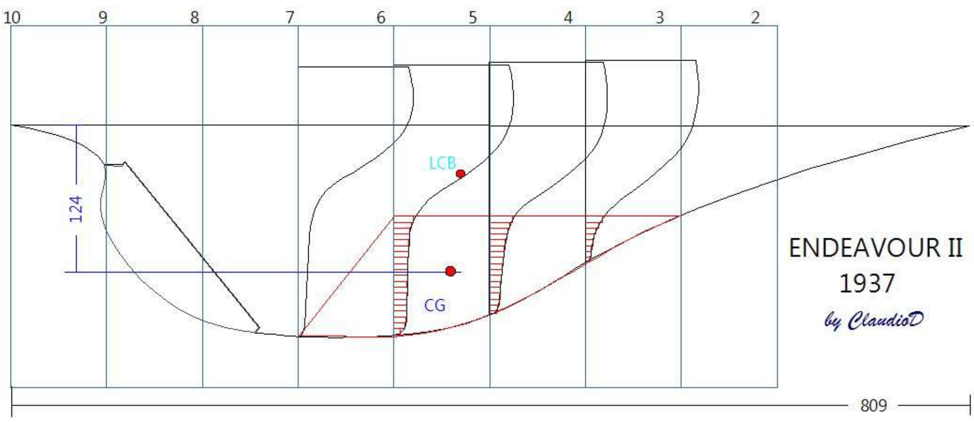
Shadows

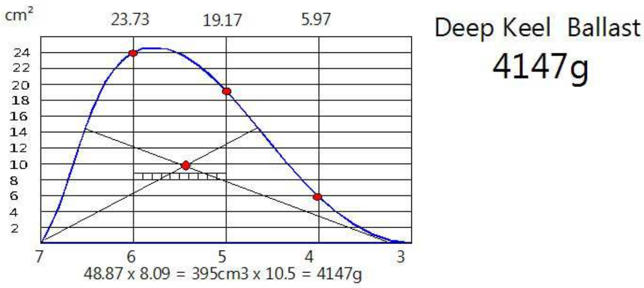


Endeavour Sail Plan & Righting Moment vs Wind Speed



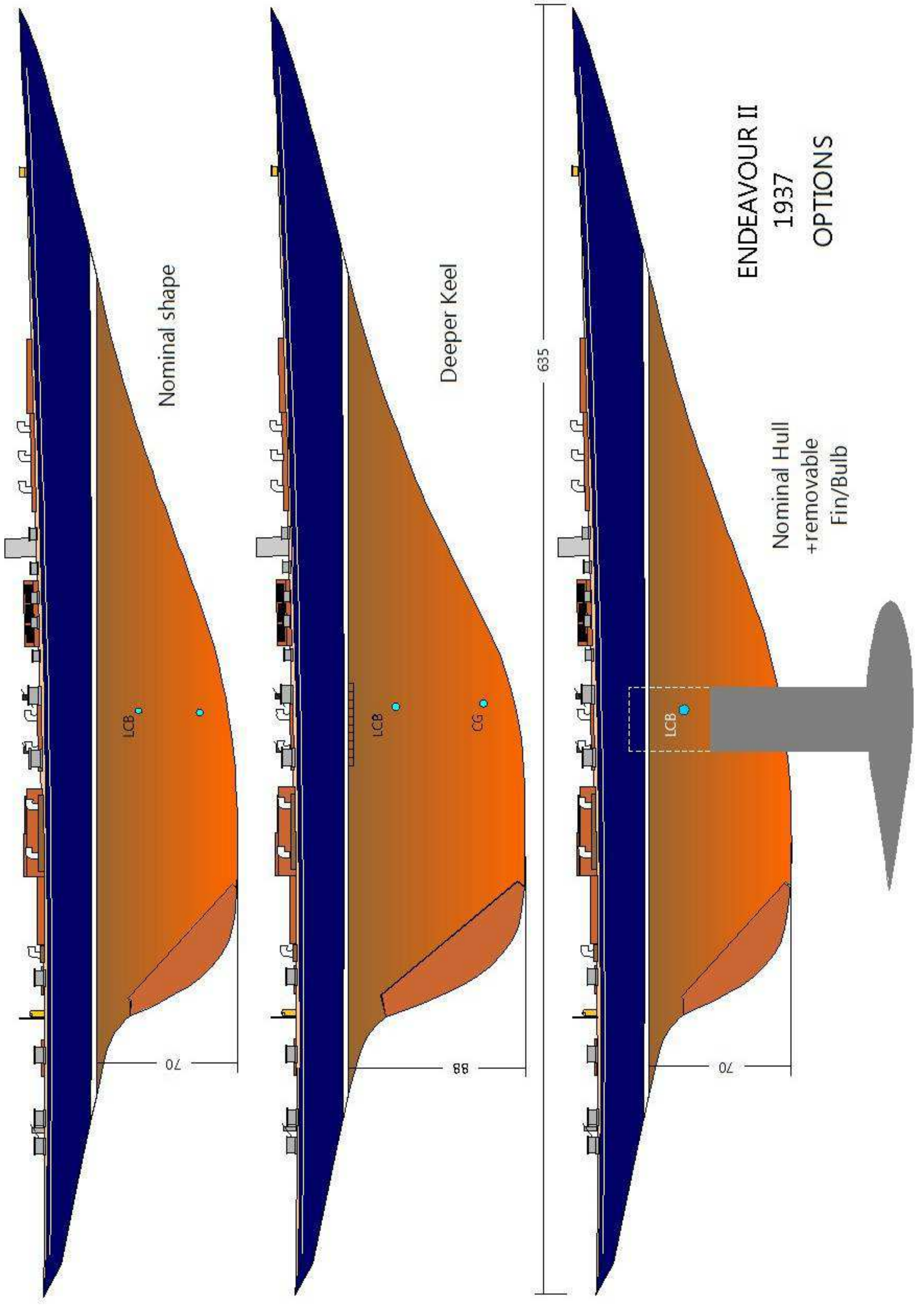




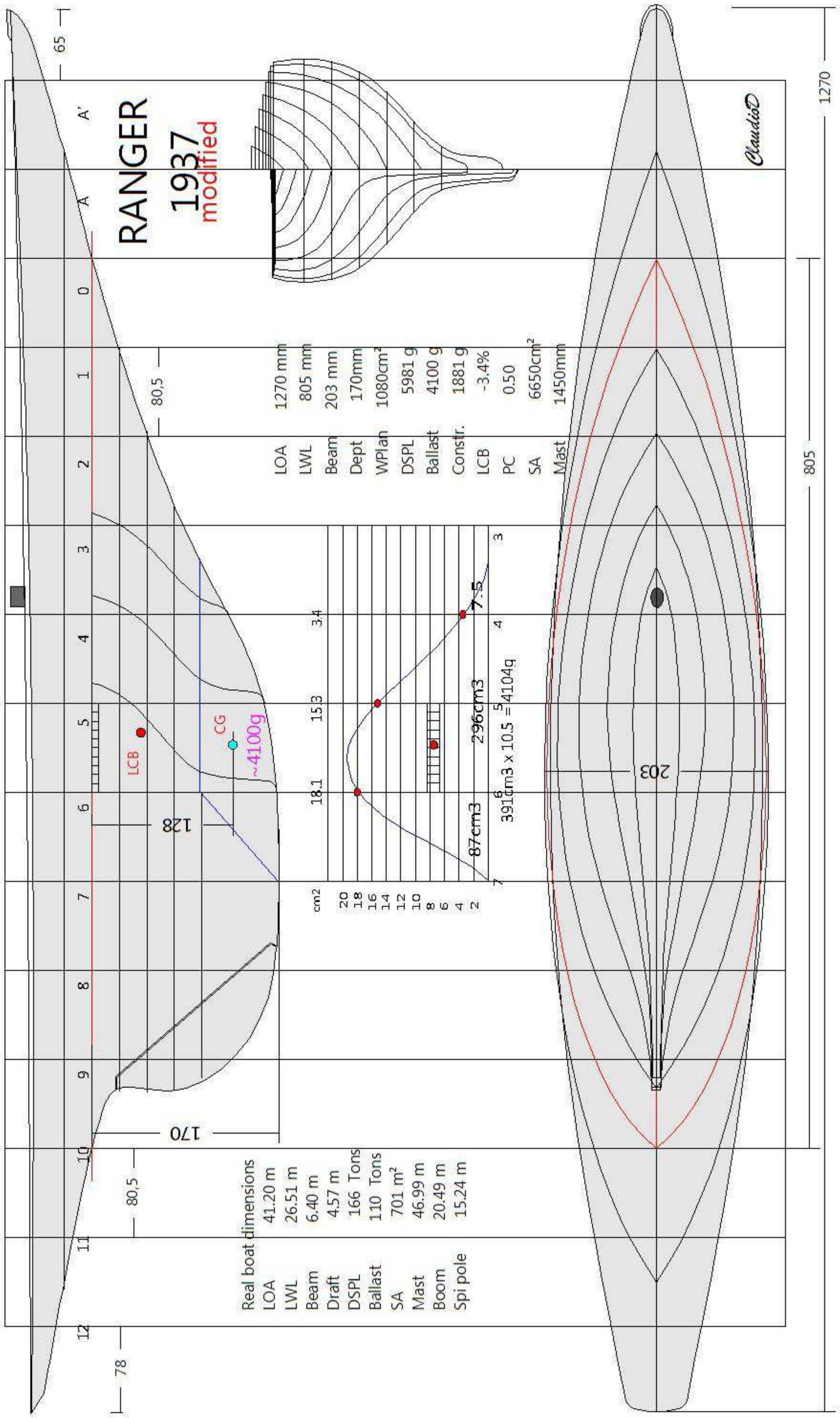


Curve of Areas – COA and Ballast

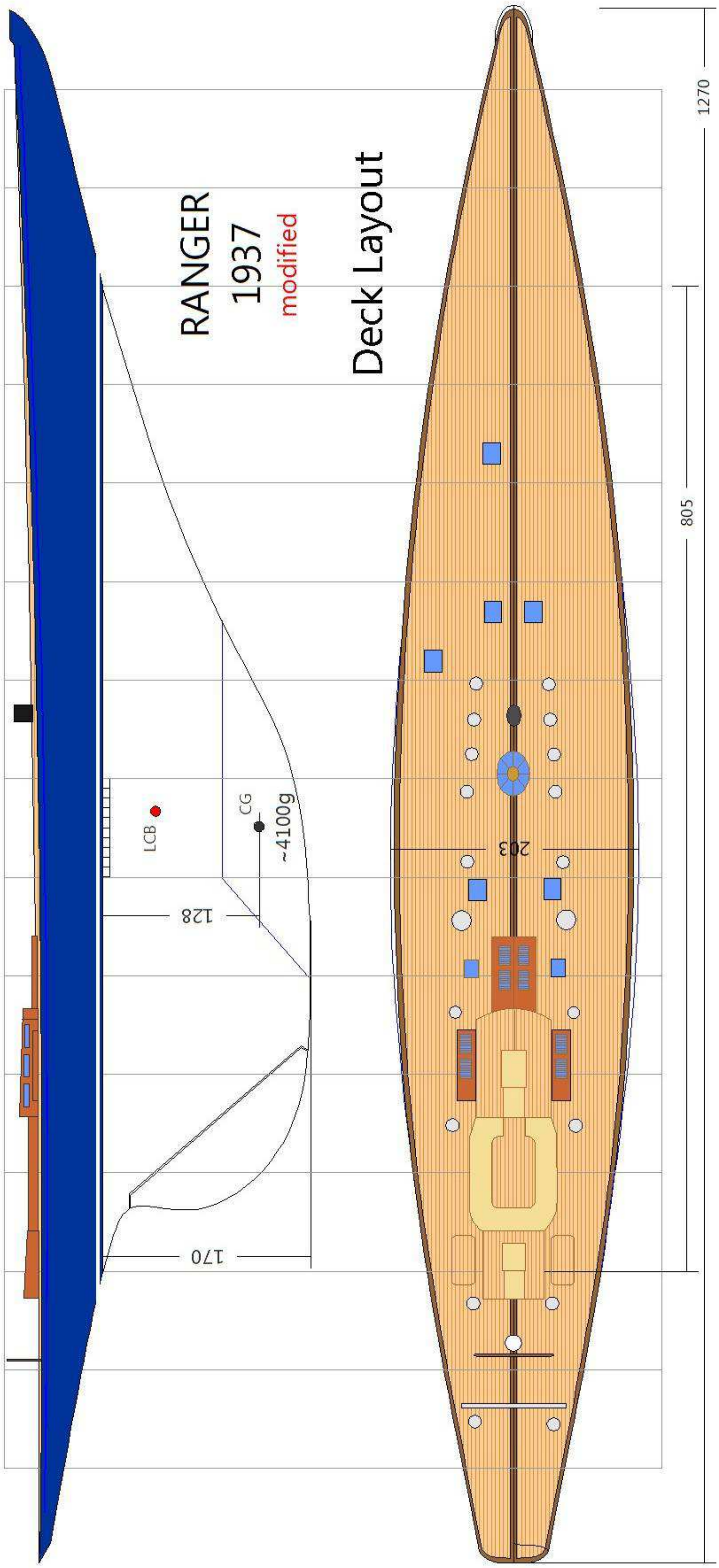
Endeavour Keel Options

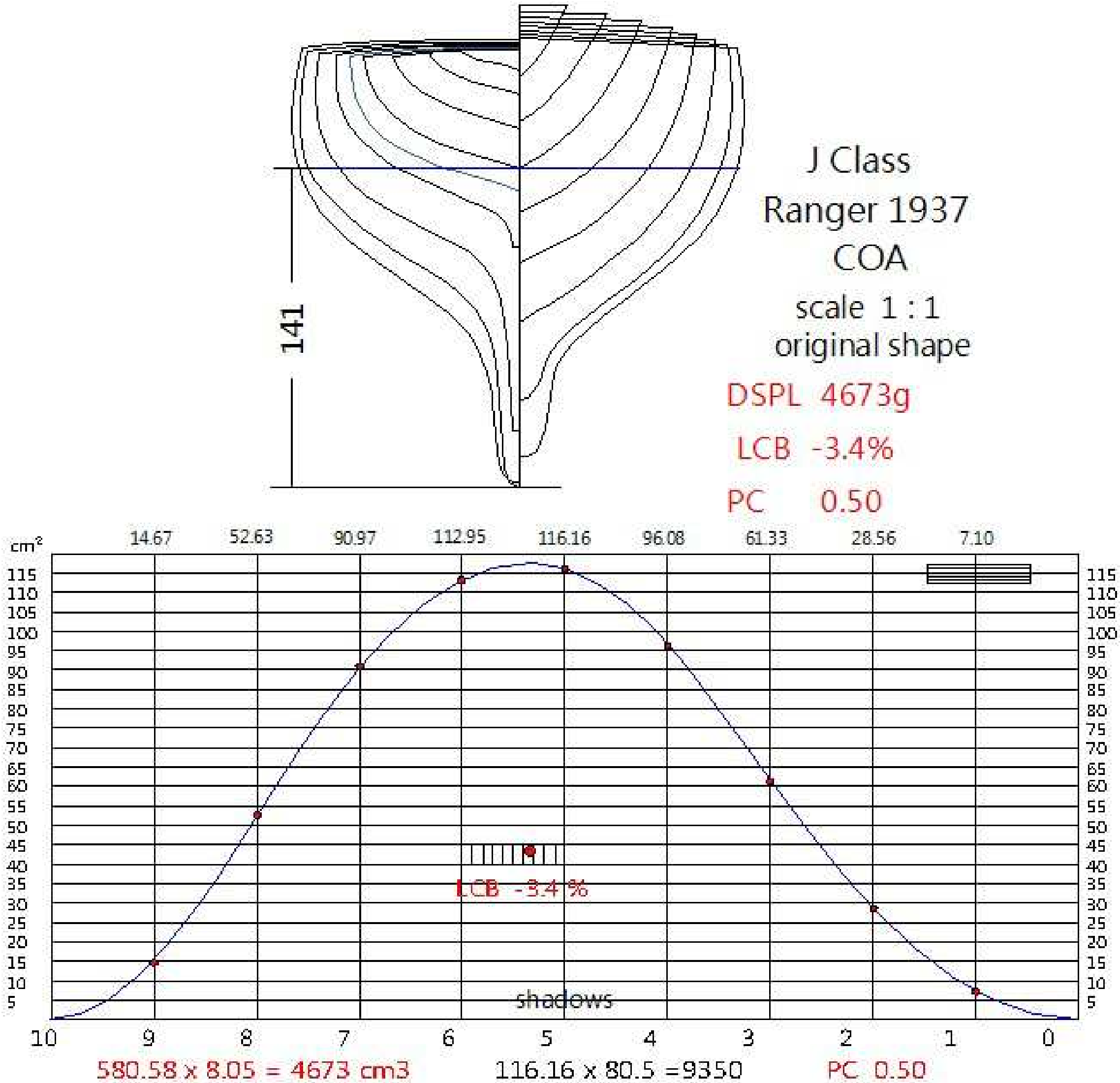


RANGER (basic drawing for LOA of 1270mm)



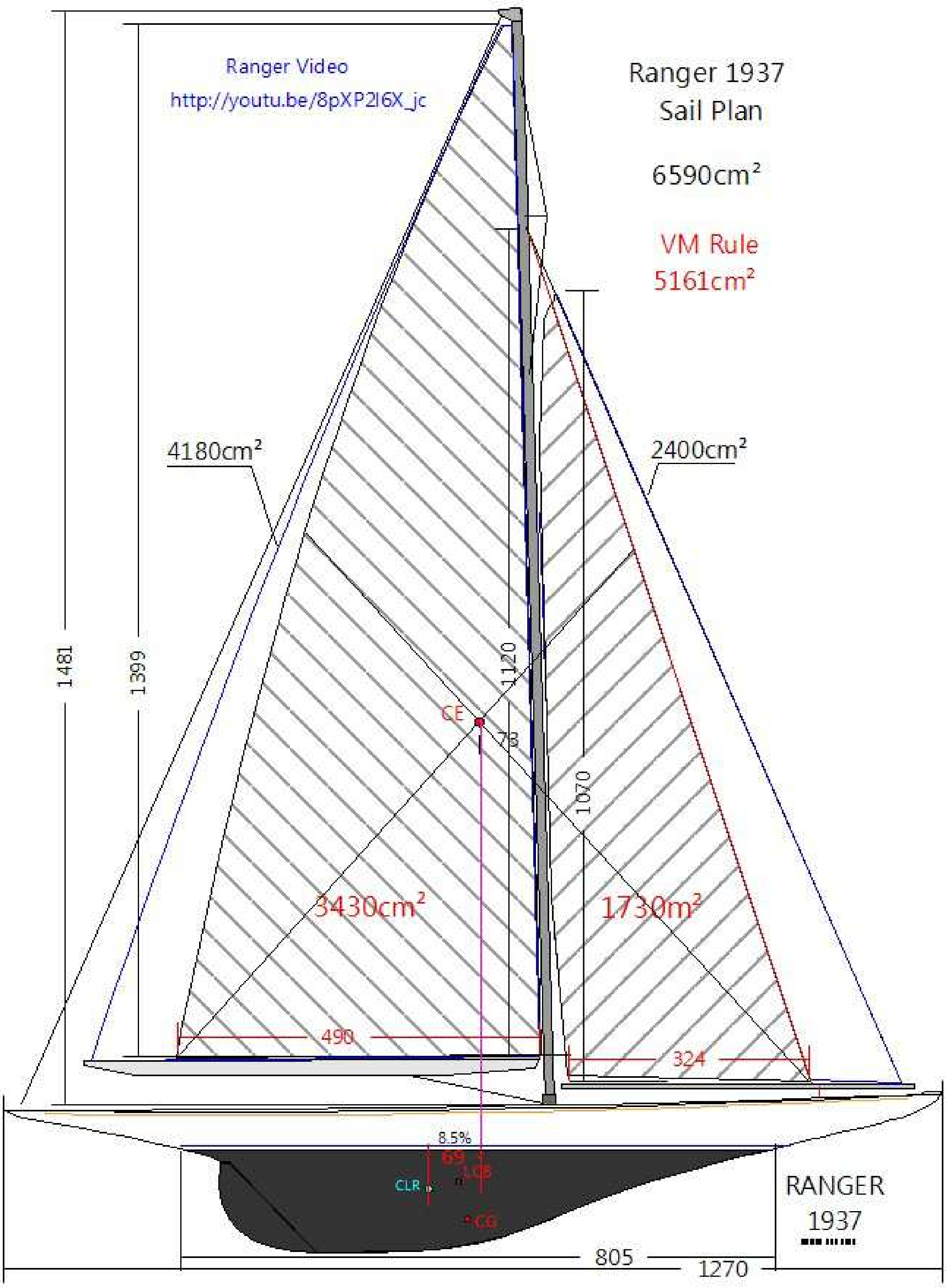
Deck layout


RANGER
1937
modified
Deck Layout
LCB
CG
~4100g
128
170
203
1270
805



Shadows and Curve of Areas

Ranger sailing plan



15 Metres JI

TUIGA
1909
By William Fife
Flagship of Monaco

Tuiga the 12Metres of William Fife was launched in 1909.

Since some years is the Flagship of Monaco.
Almost every year is participating, among several other events, to the "Regates Royales" in Cannes (Cote d'Azur – France):

http://regatesroyales.com/en/

At the "Vieux Port" of Cannes and during the "Regates Royales" week, I met the person in charge of the Tuiga Yacht.
I told him that I was interested to build a Model of the Tuiga and asked if was possible to have some drawings.
The response was negative, according to my interlocutor; the Club has never seen any drawings, except the ones published by a French Magazine.
I got the copy of the Magazine and found out that the drawings were not adapted to build a model, therefore I started to redraw them at the best I could.
After a couple of months the detailed drawings were ready
I passed a copy of the drawings to the Yacht Club representative while myself I started procuring the material for the construction.

I'm thankful to Mr. Fontana and the YCM that allowed me to take the Tuiga pictures once in Cannes and Menton in 2007.

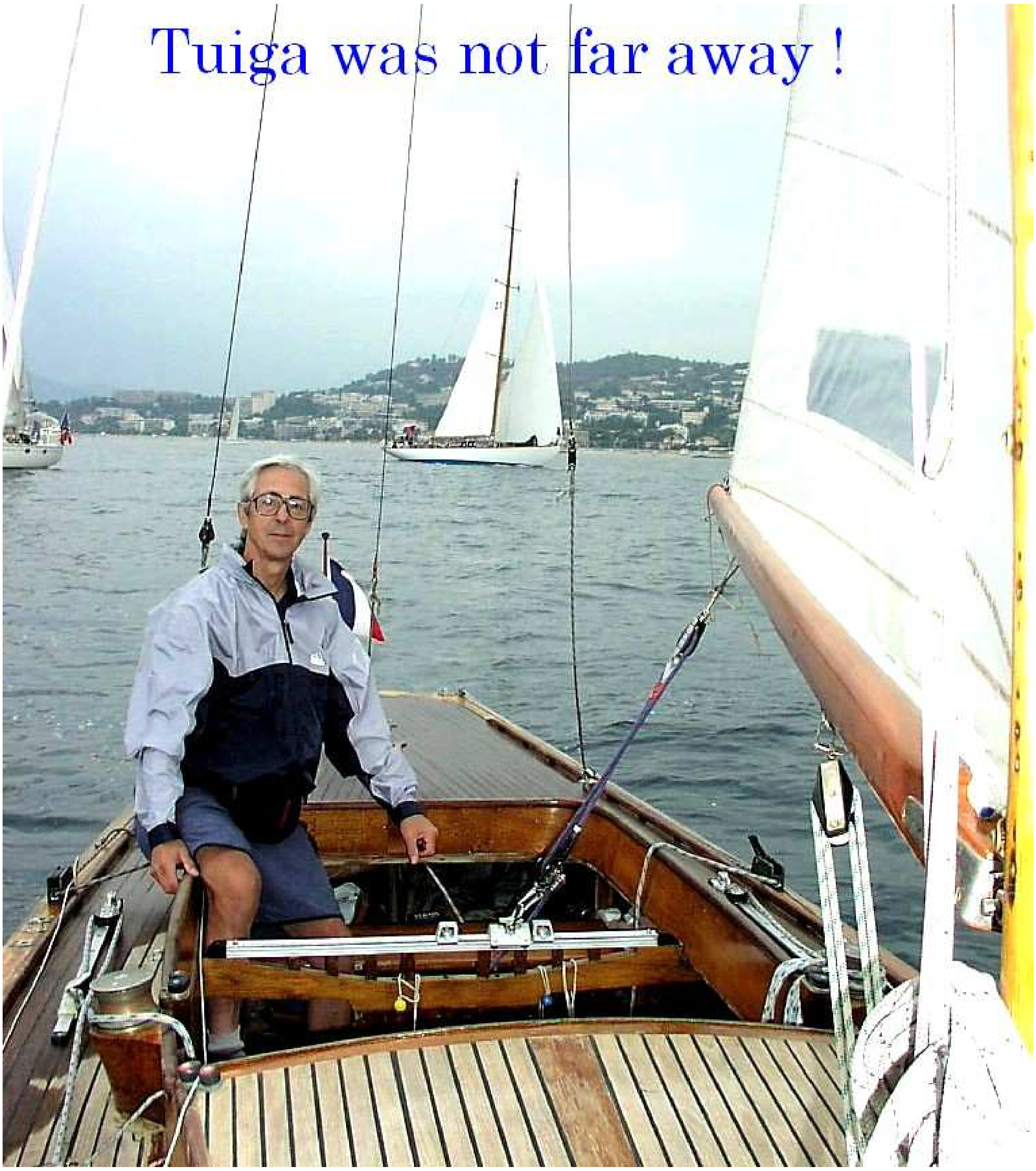
In the following pages the words are replaced by pictures.

Unfortunately, in 2014, the model work was stopped due to a surgical operation caused by a Hernia.
The full model was offered for free to a modeler that promised to finish and launch it.
Since, non feedback yet

In Cannes side to side with Tuiga

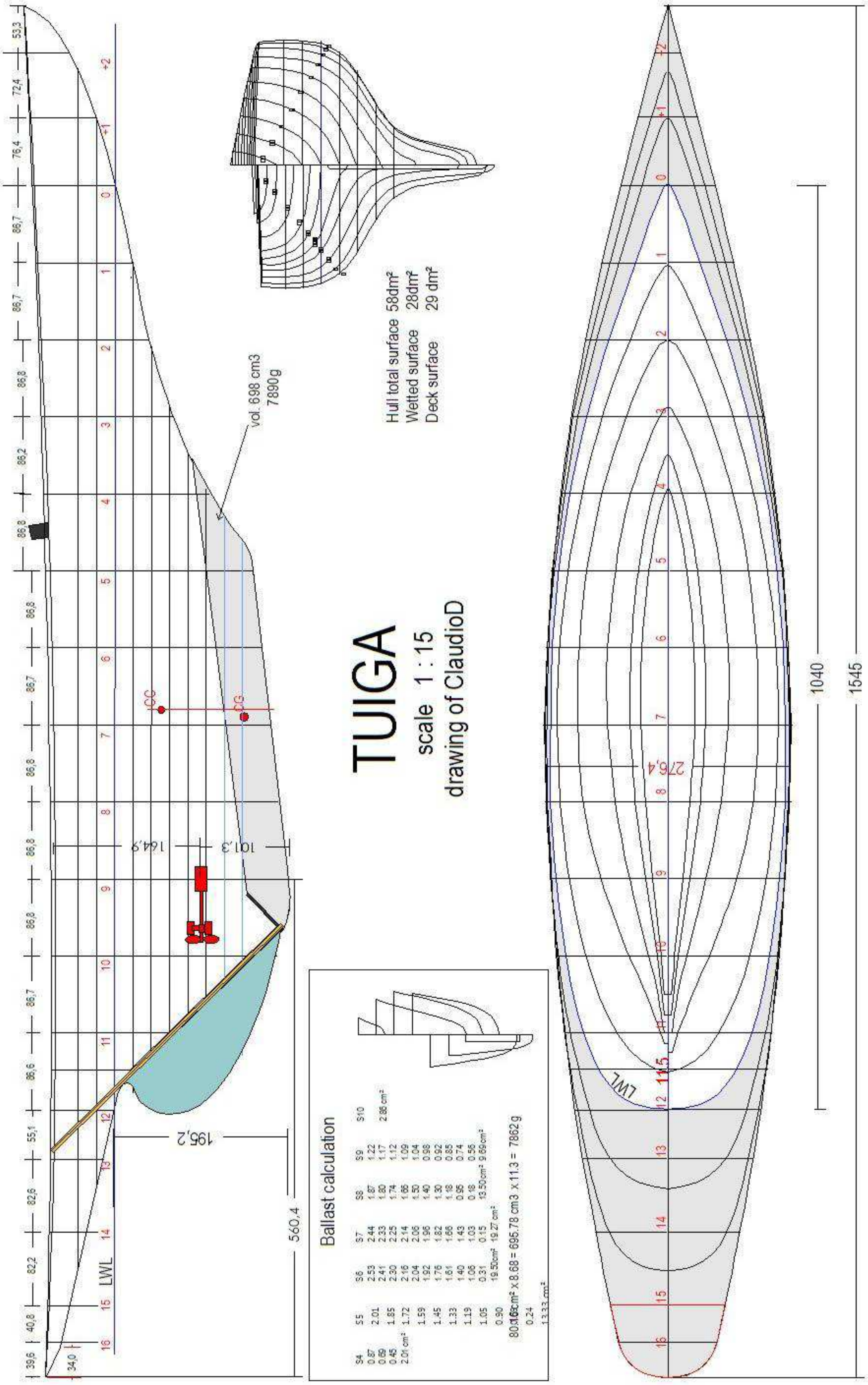
Pictures taken during the "Regates Royales" in 2004

Tuiga Main Boom symbol

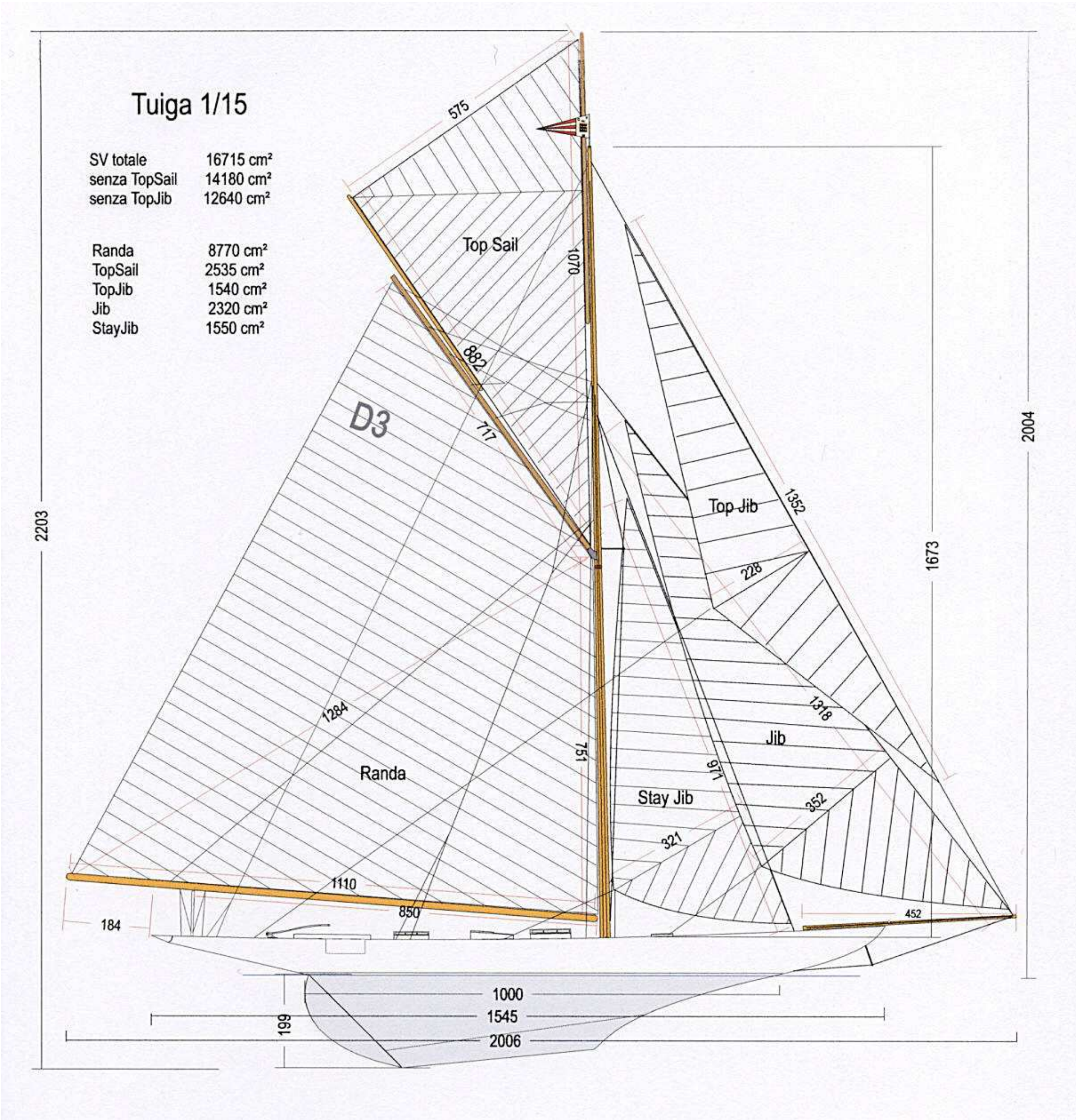


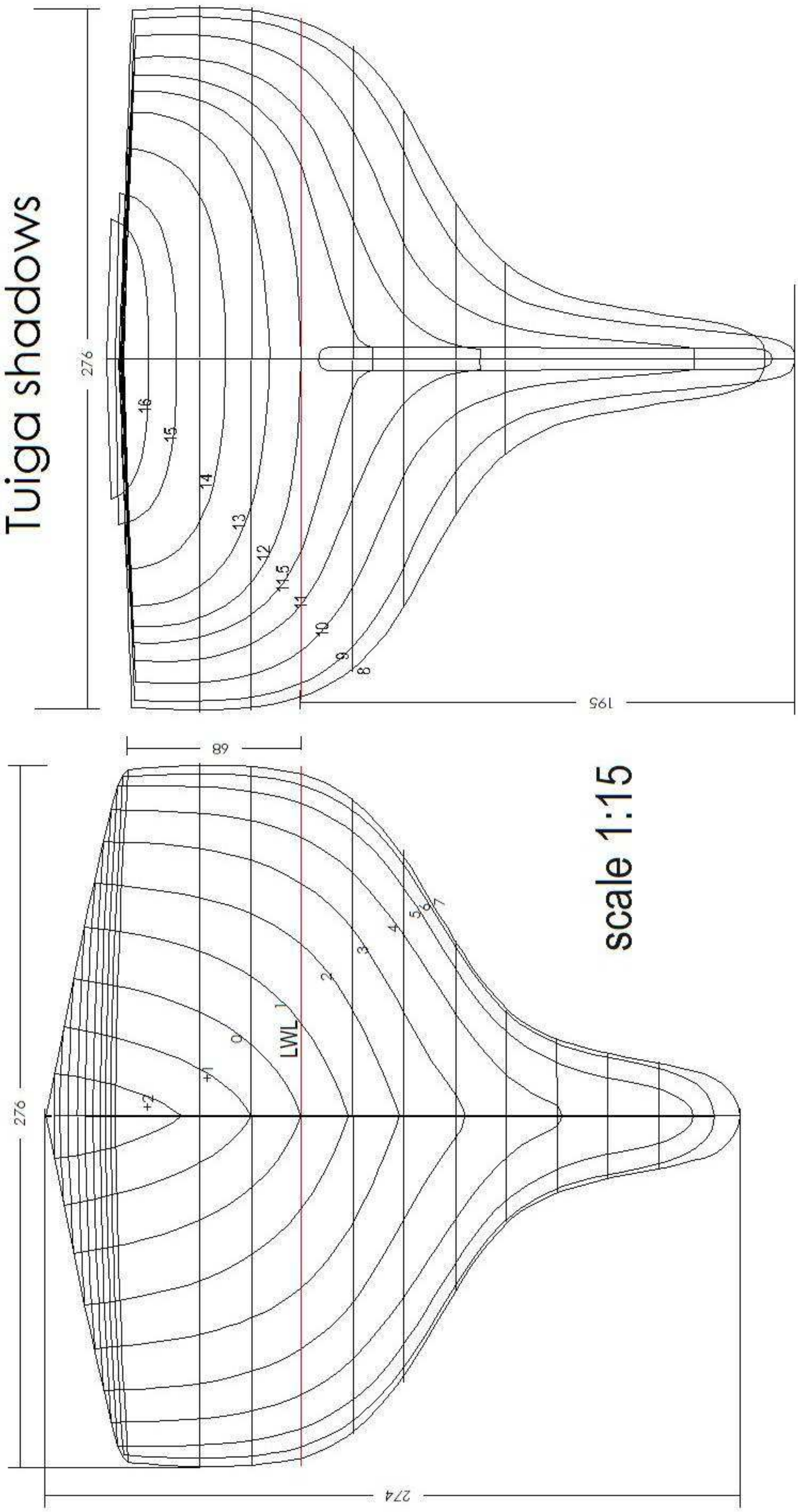
Me close watching at the Regates Royales

My 1st drawing

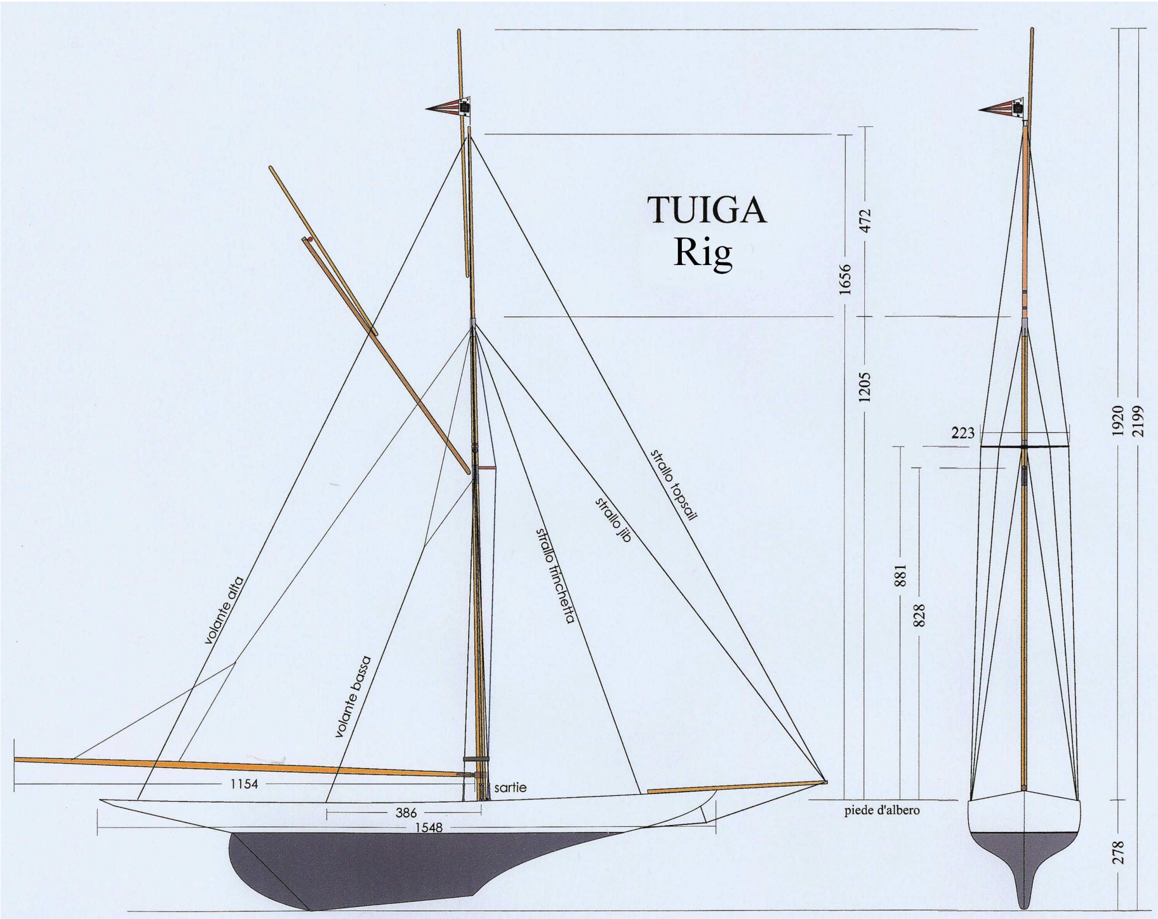


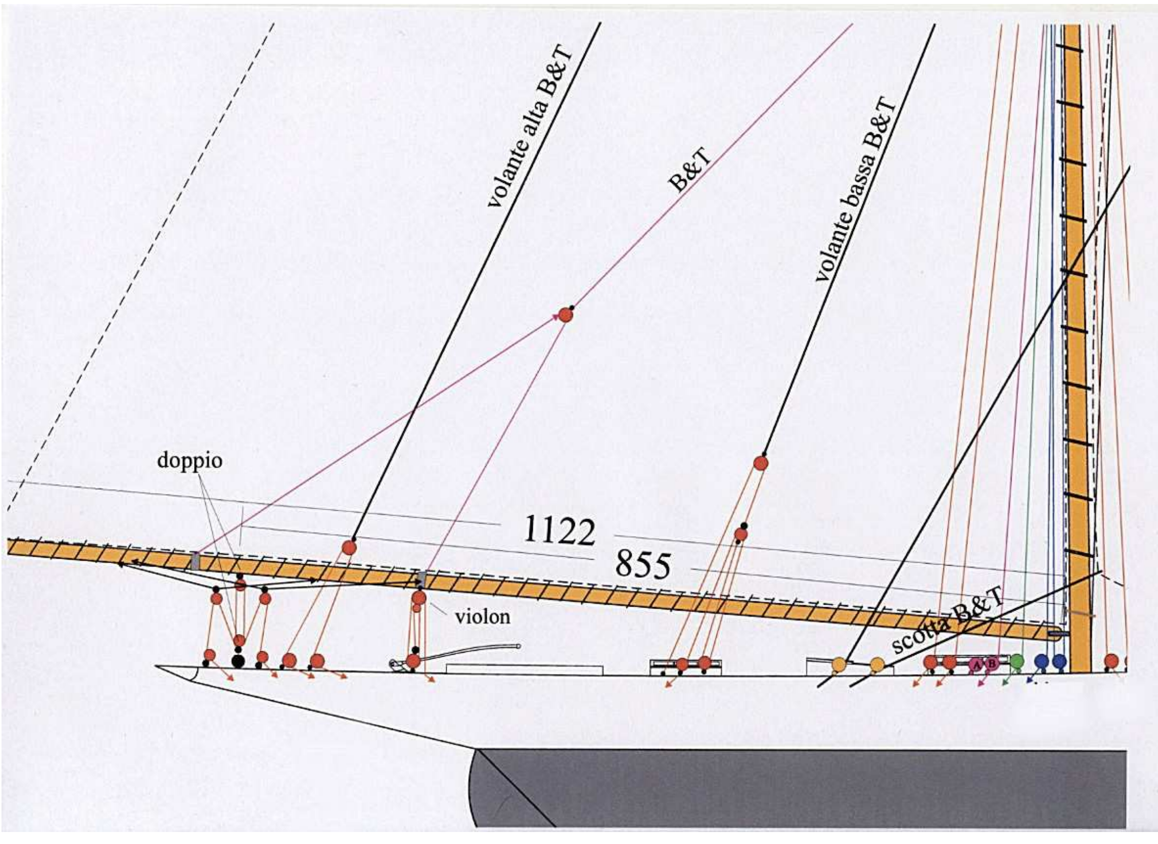
Tuiga Sail Plan

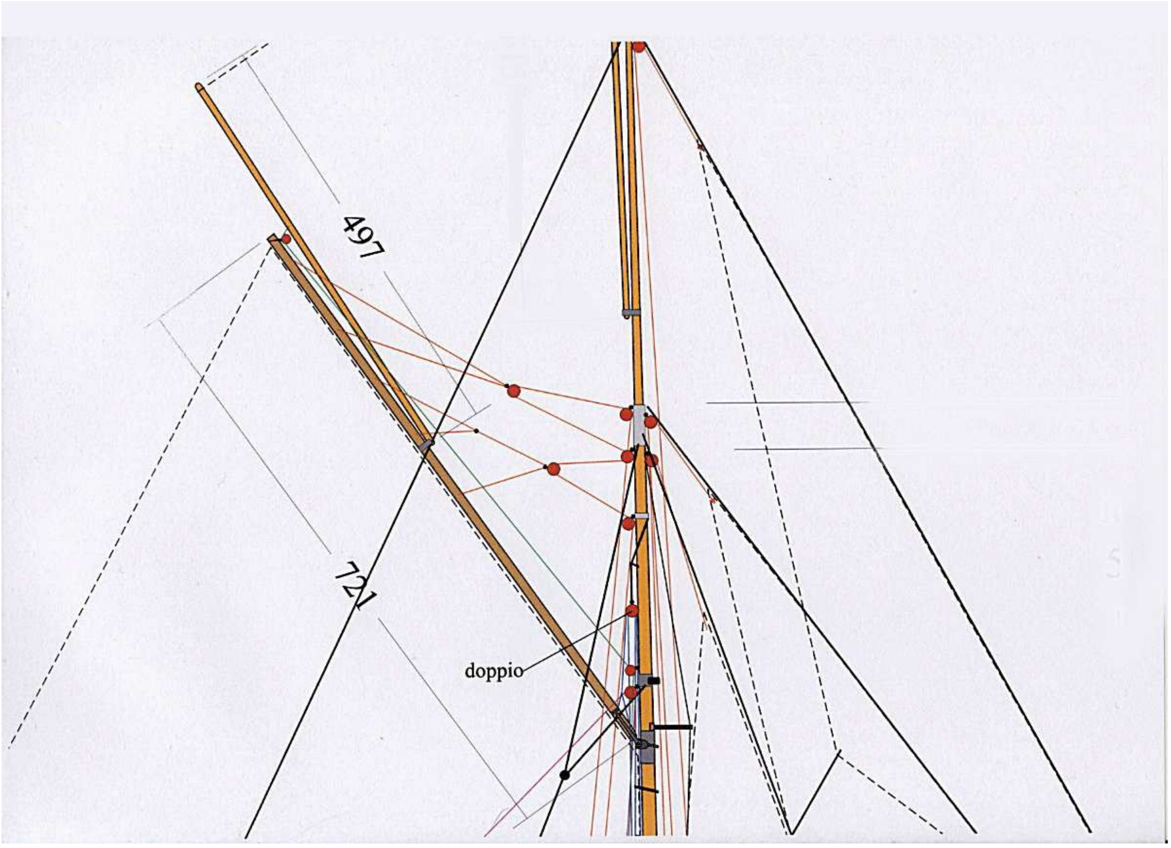


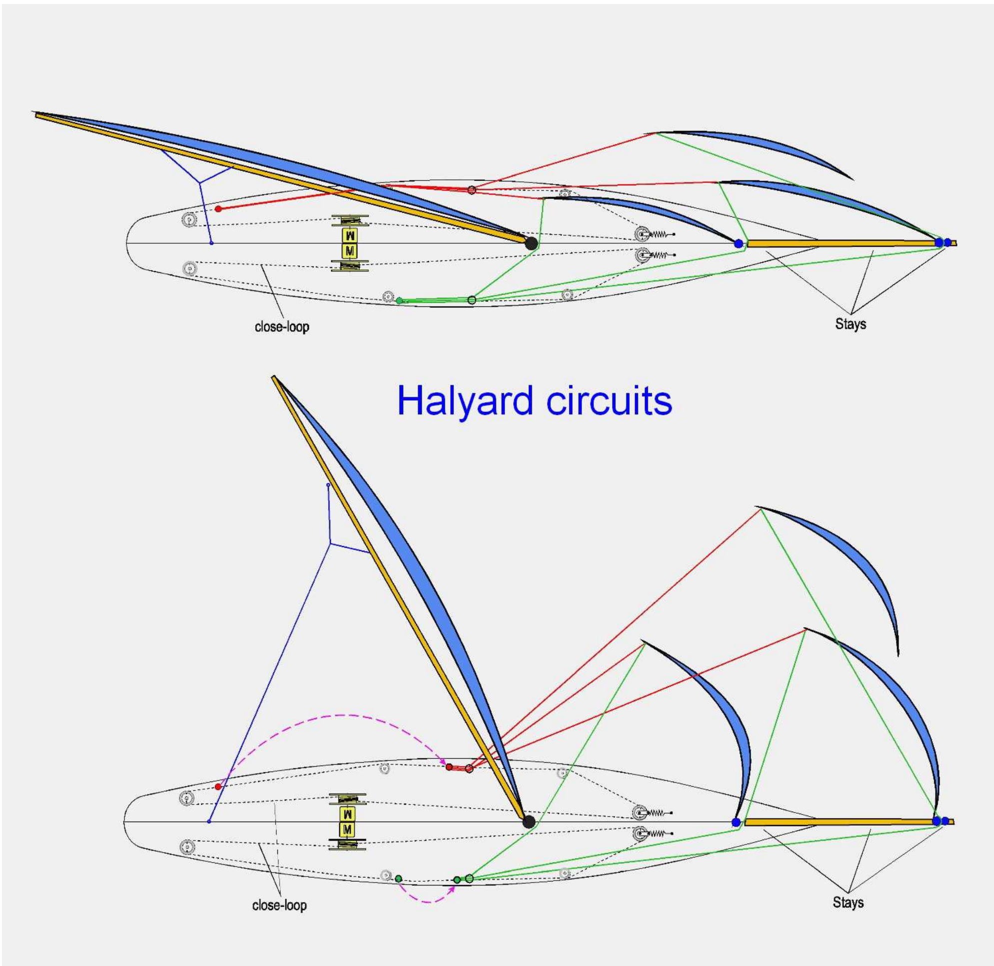


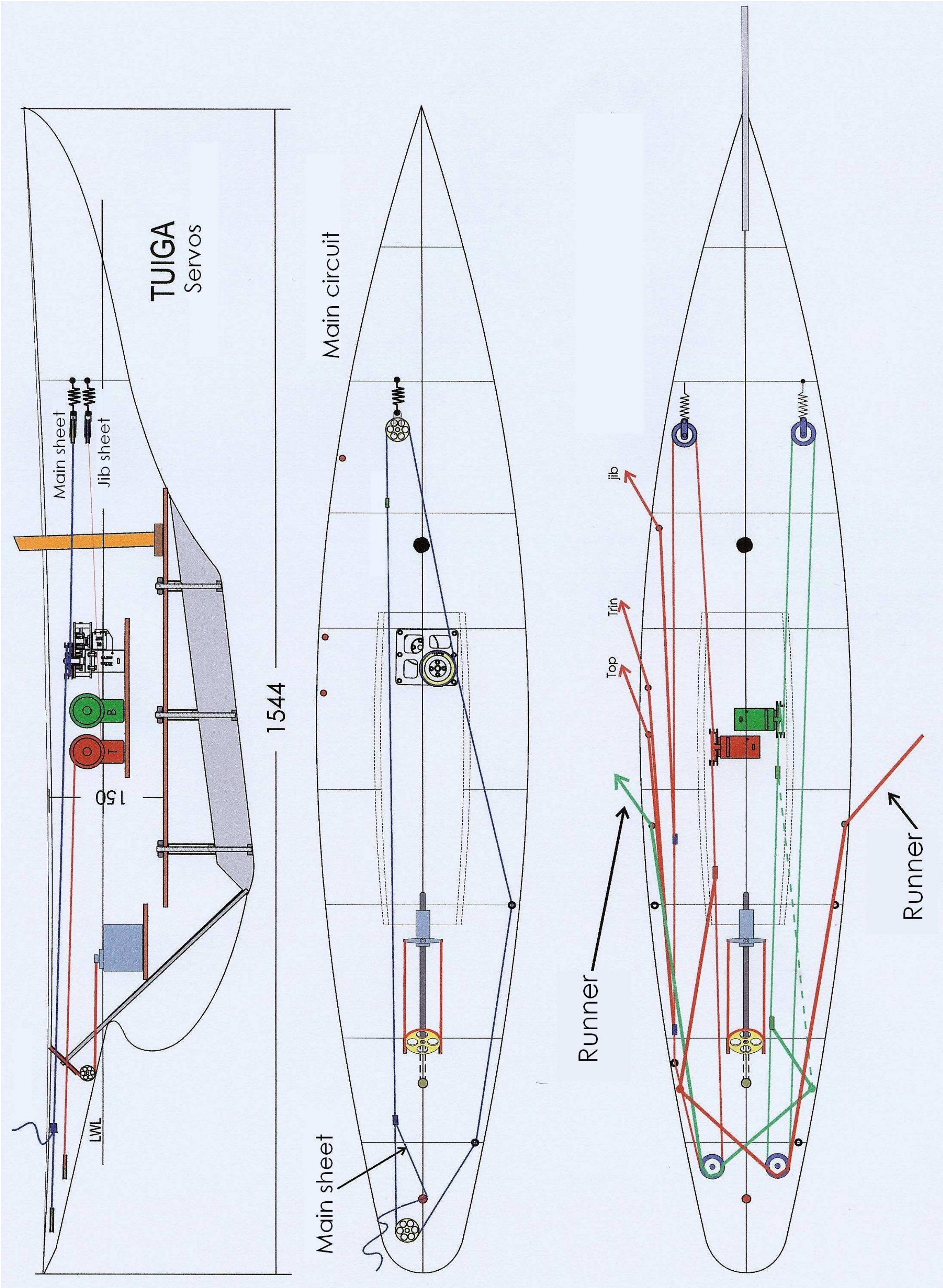
Tuiga Shadows scale 1:15


TUIGA
Rig
volante alta
volante bassa
strallo trinchetta
strallo jib
strallo topsail
sartie
1154
386
1548
472
1656
1205
881
828
223
1920
2199
278
piede d'albero


volante alta B&T
B&T
volante bassa B&T
doppio
1122
855
violon
scotta B&T

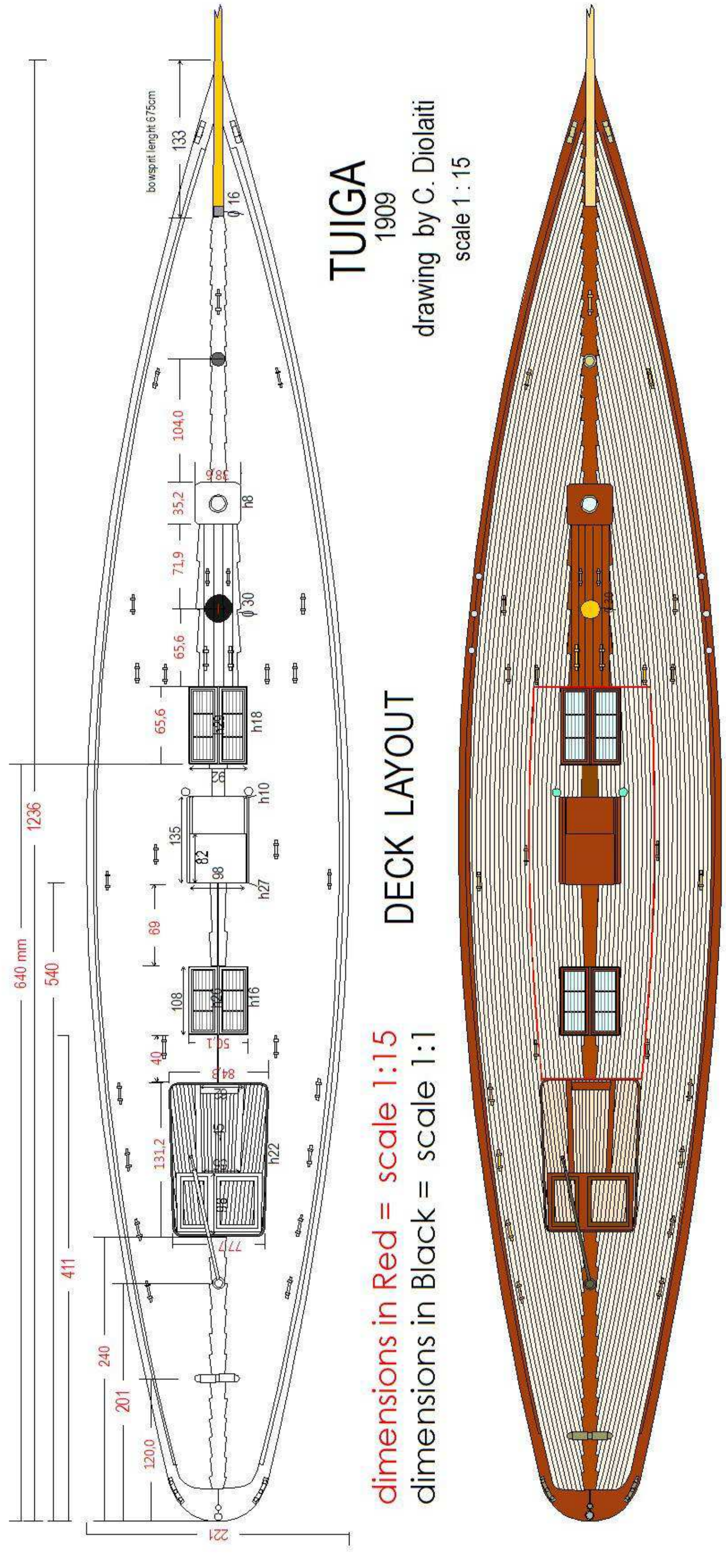

497
721
doppio


close-loop
Stays
Halyard circuits
close-loop
Stays



Rig drawing the most time spending

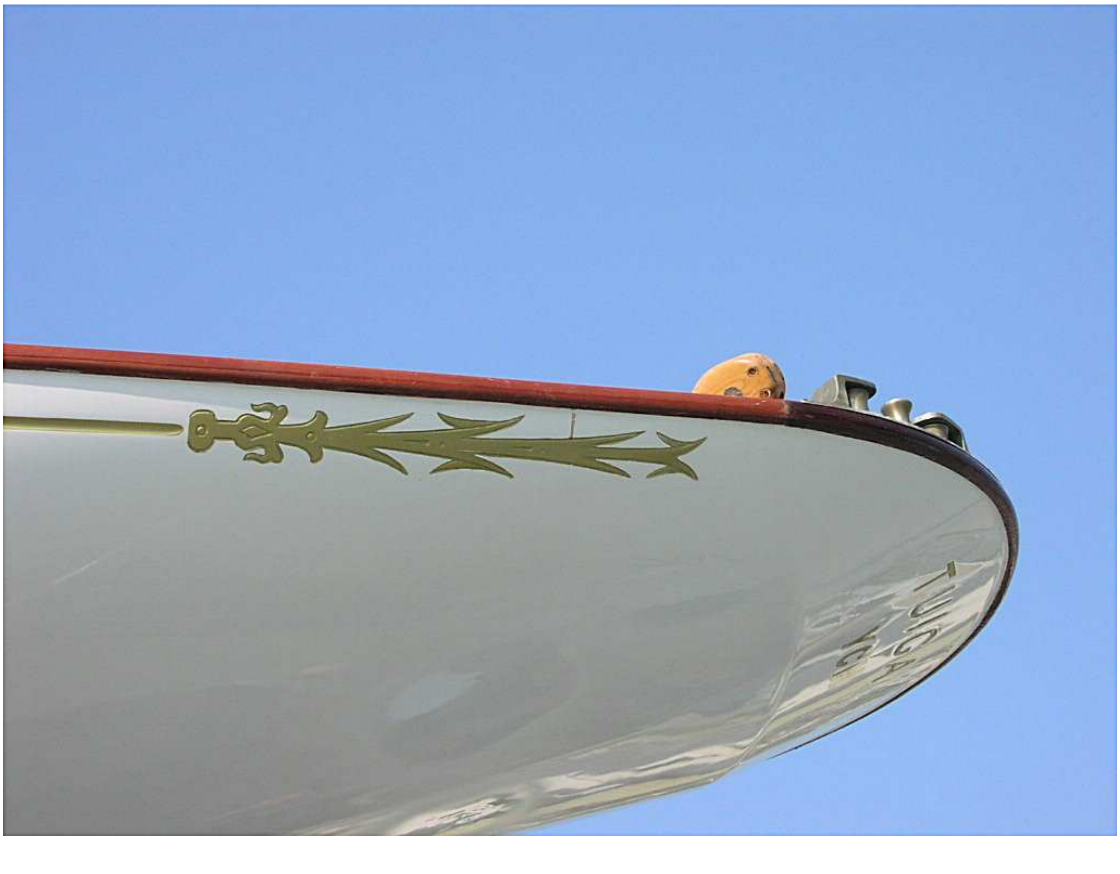
In Menton for servicing



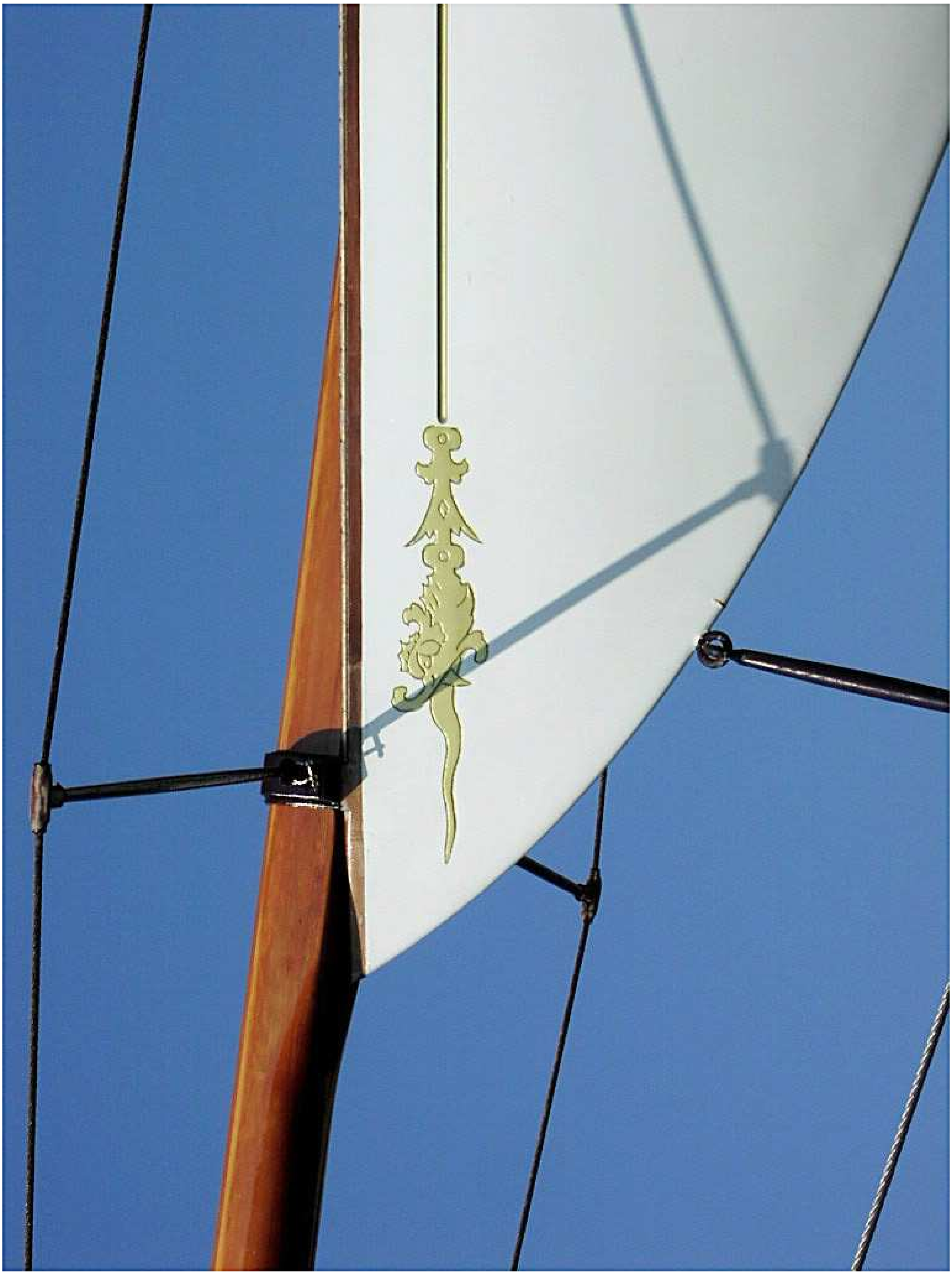

Tuiga

The Mast !

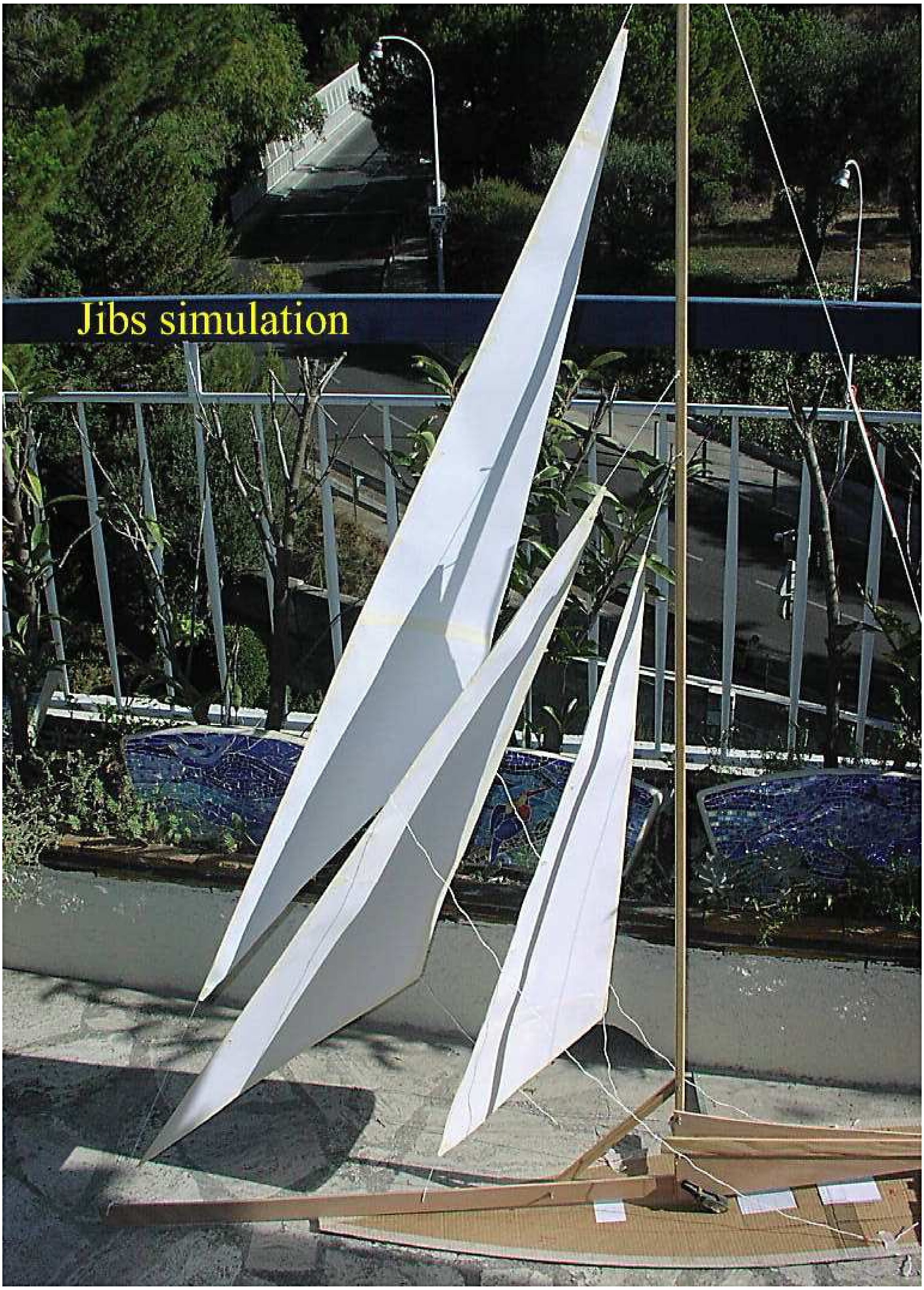

Tuiga mast



The Stern

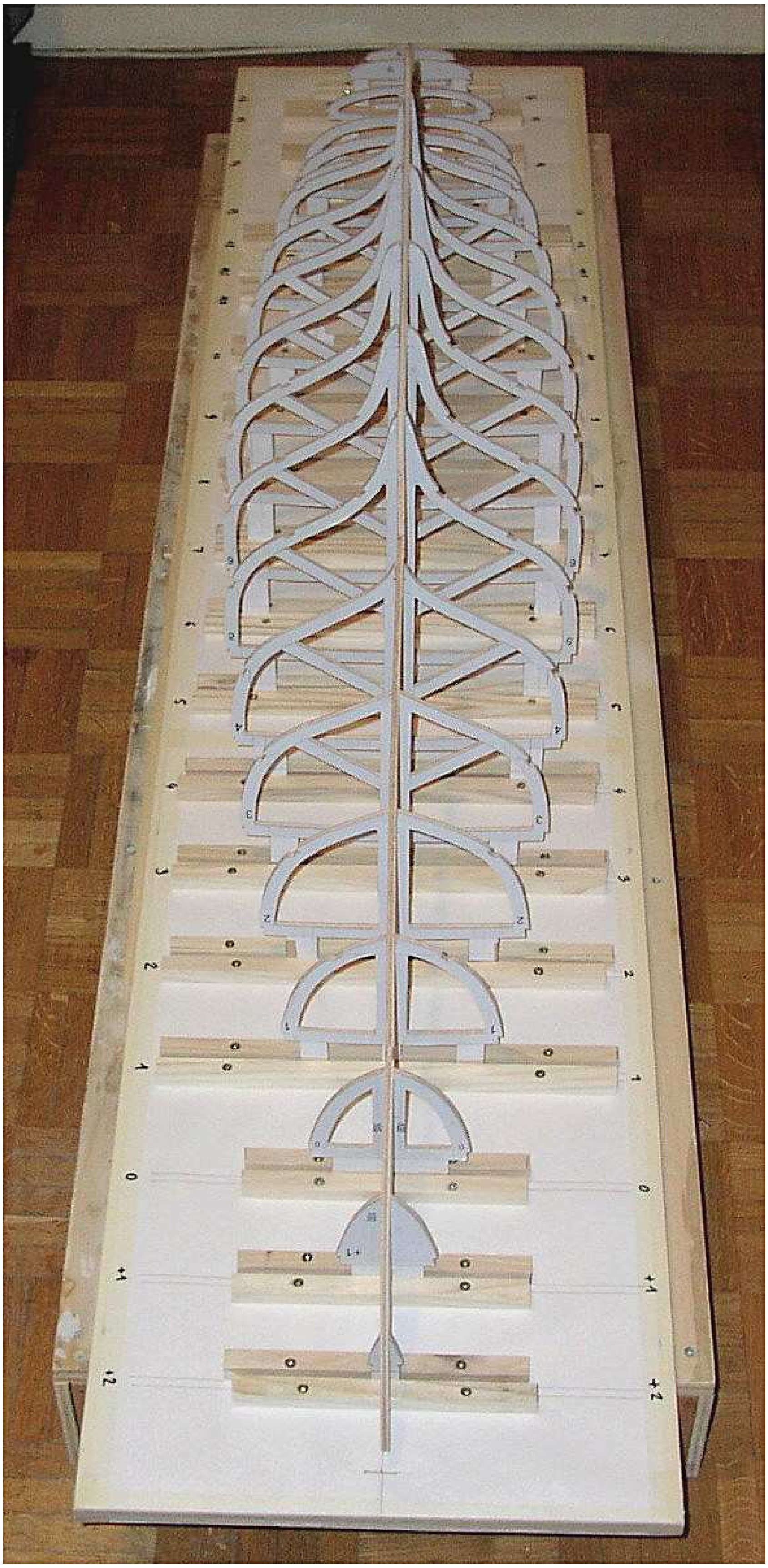


The Bow



Simulation of forward sails

The propeller

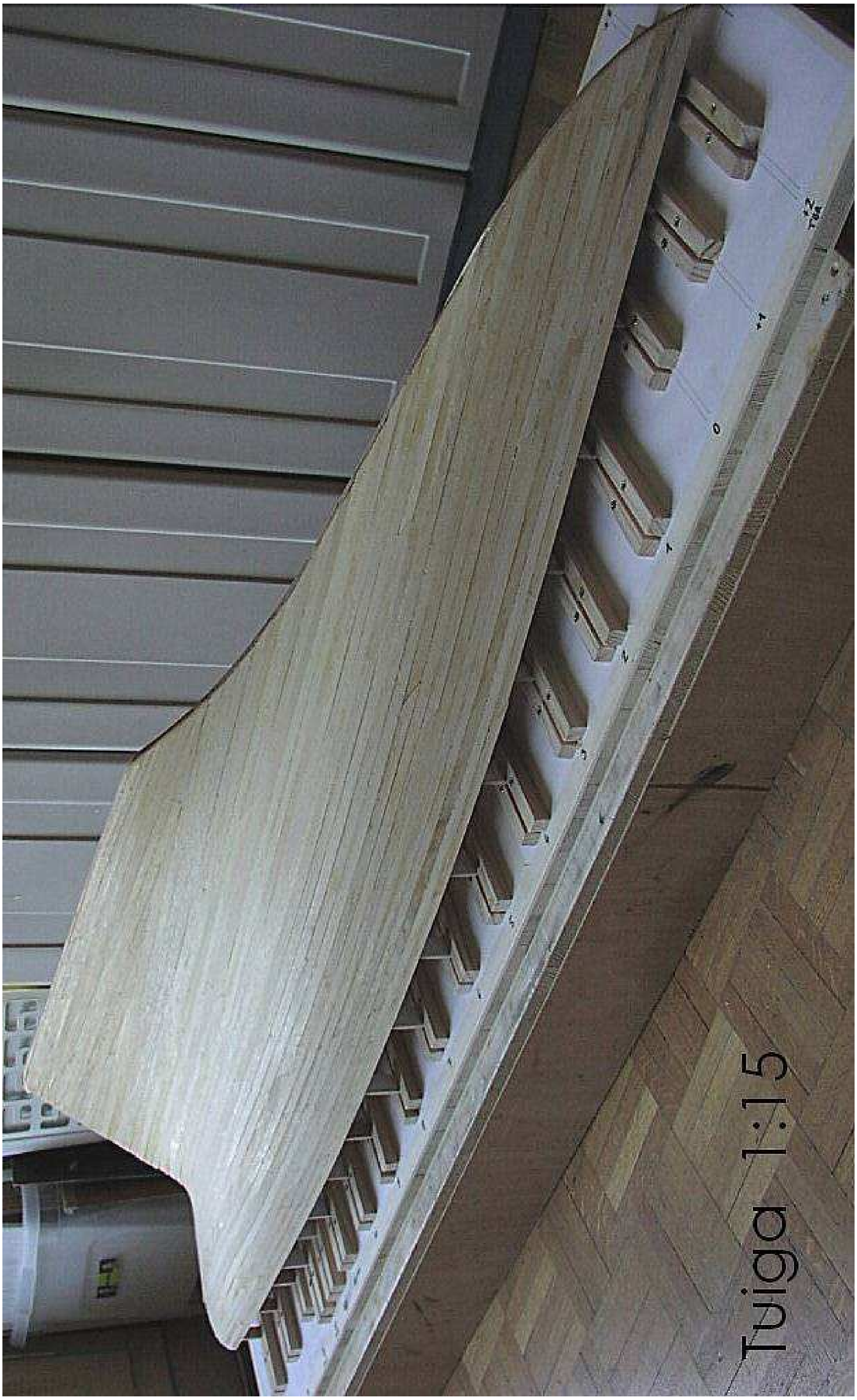


Shadows in place

Tuiga and Studio 3

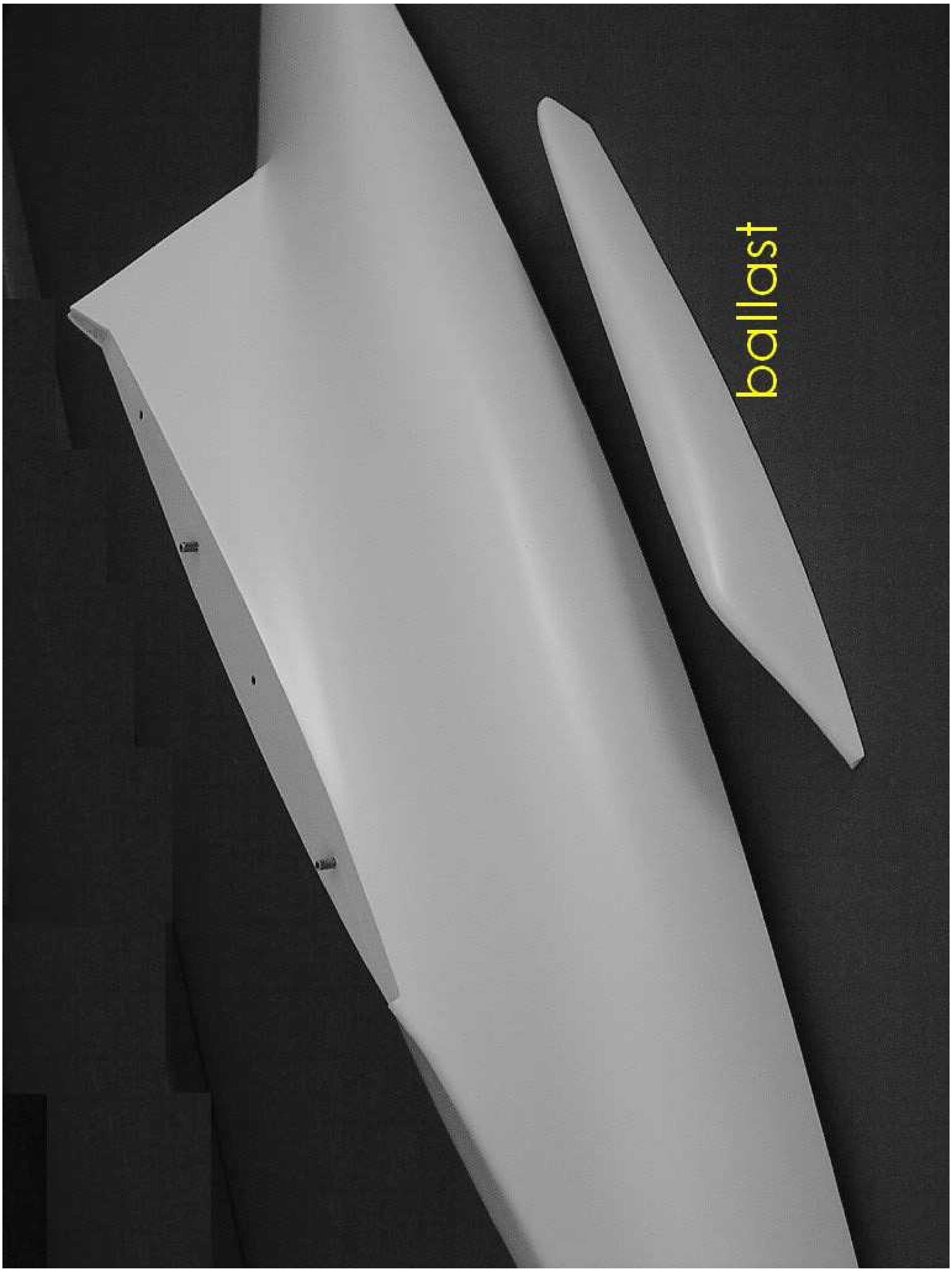
Classical strip planking


Tuiga 1:15


Tuiga 1:15

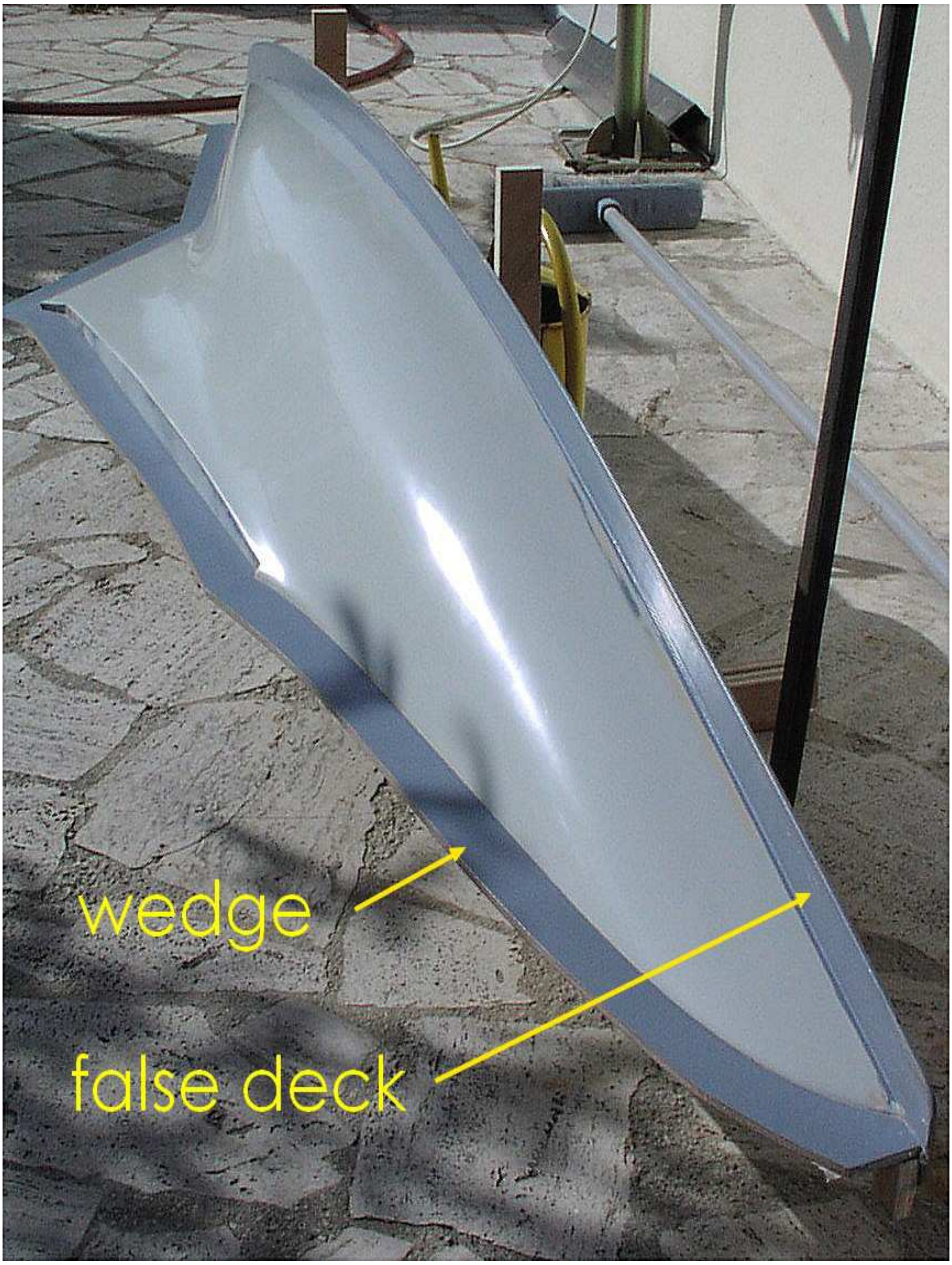

ballast
mock-up

Keel & Ballast


ballast

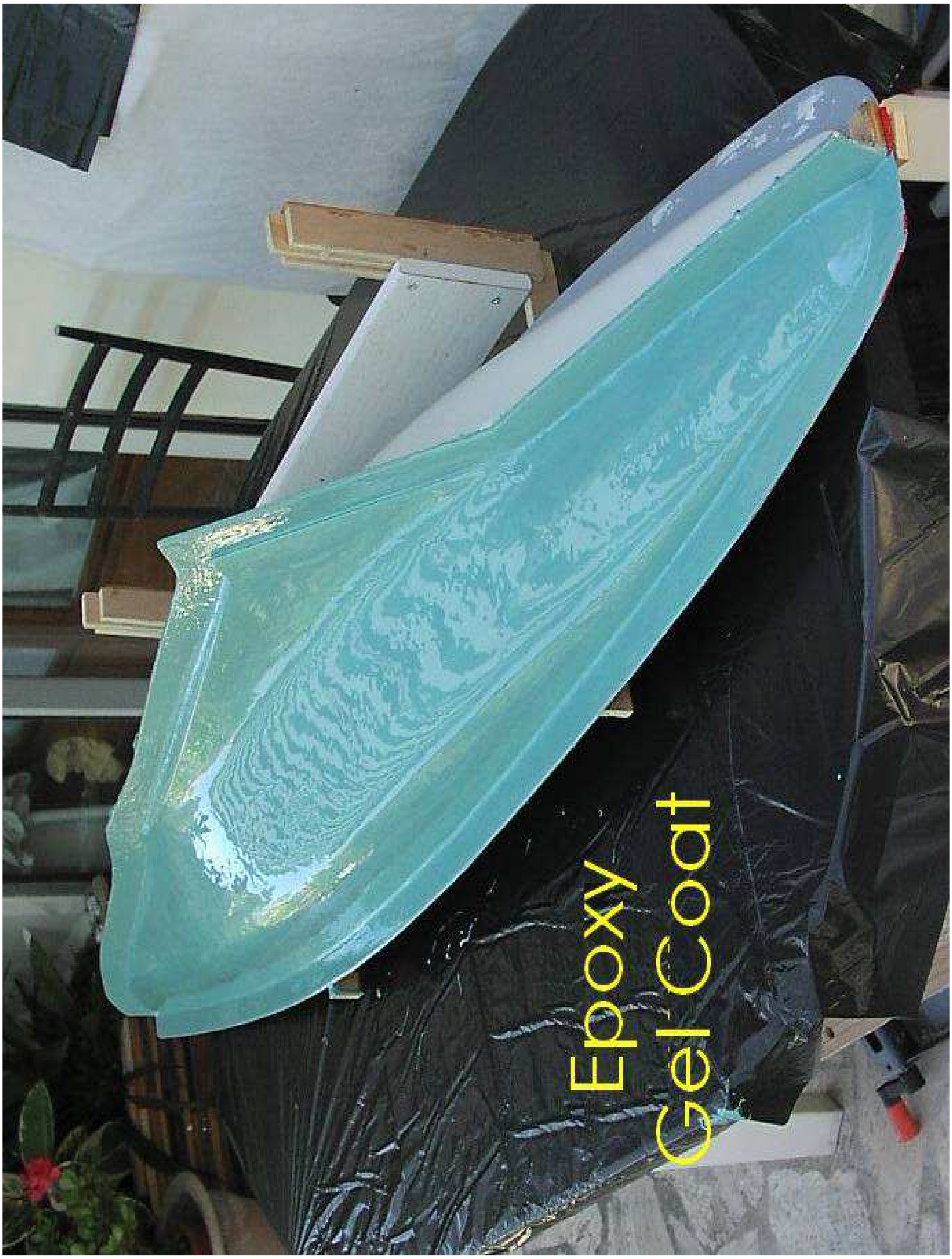

False deck

Preparing for female Mold construction

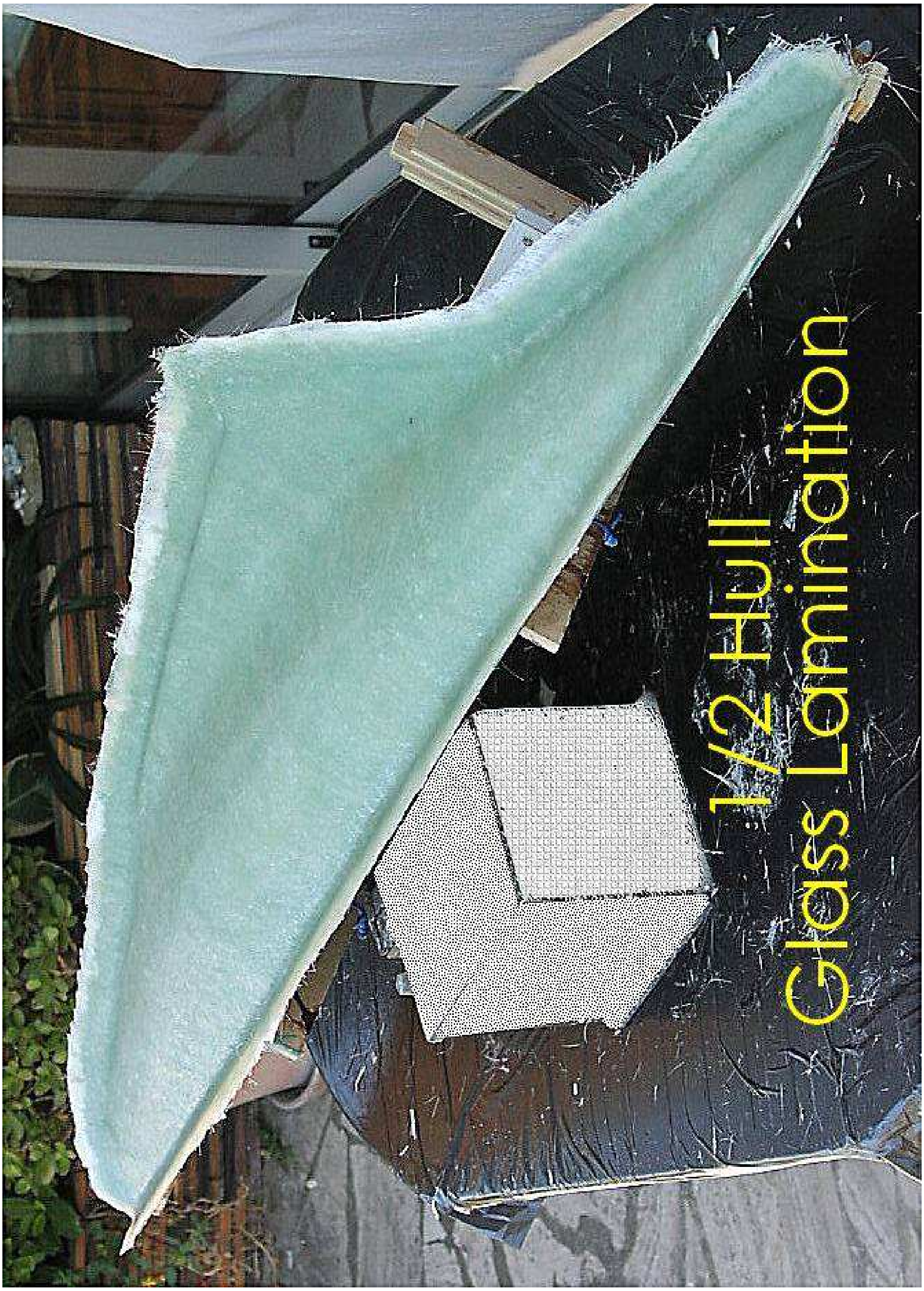



carton wedge
& tape

Two layers of Gel-Coat at half hour distance



Glass lamination with several layers of tissue of different weight




the half mould
acts as a counter
support for the
second half

Mold almost complete missing removal of tissue excess

Separation of the two halves

The two halves are joined with the use of bolts

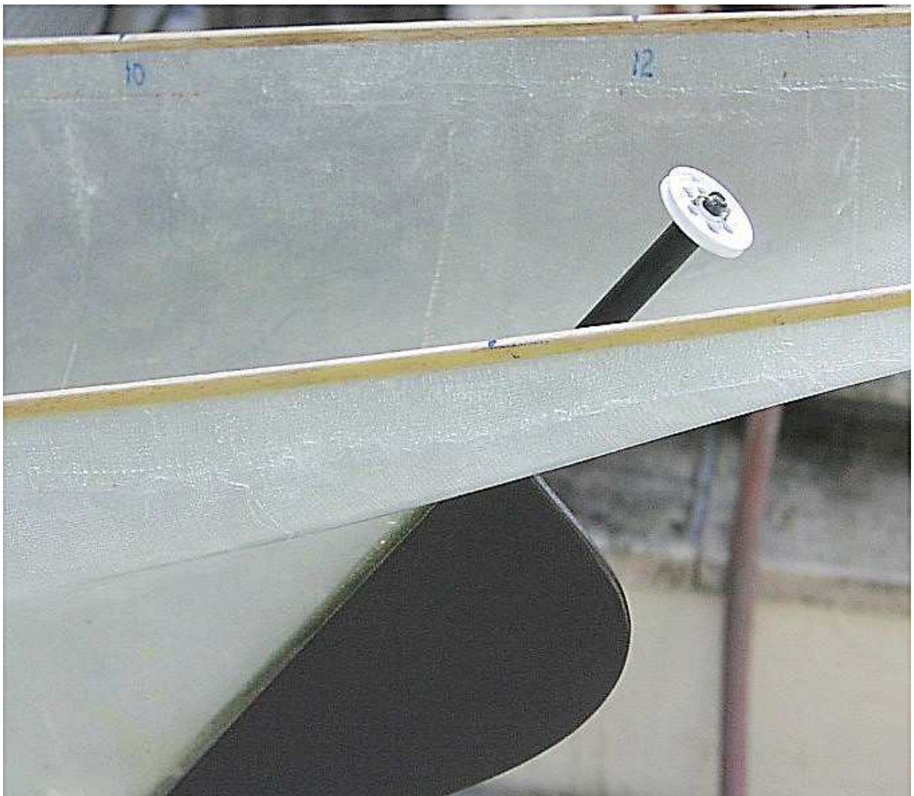
Integration of supports

Hull Epoxy-Glass lamination

Two hulls laminated one with Carbon Kevlar tissue and the second only with Glass tissue

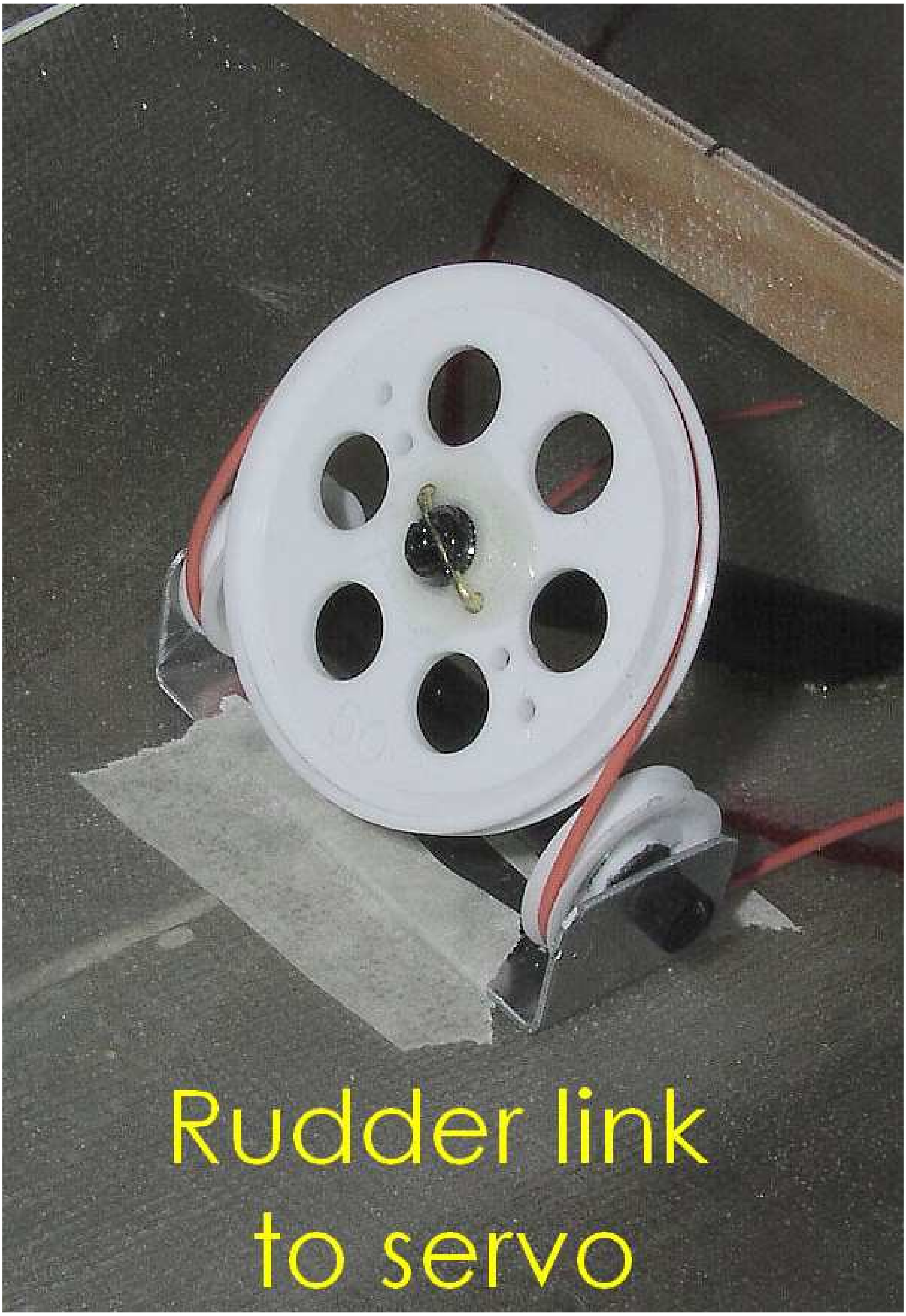
Glass Hull 300g lighter!

Rudder trunk with 8mm Carbon Tube



Model rudder

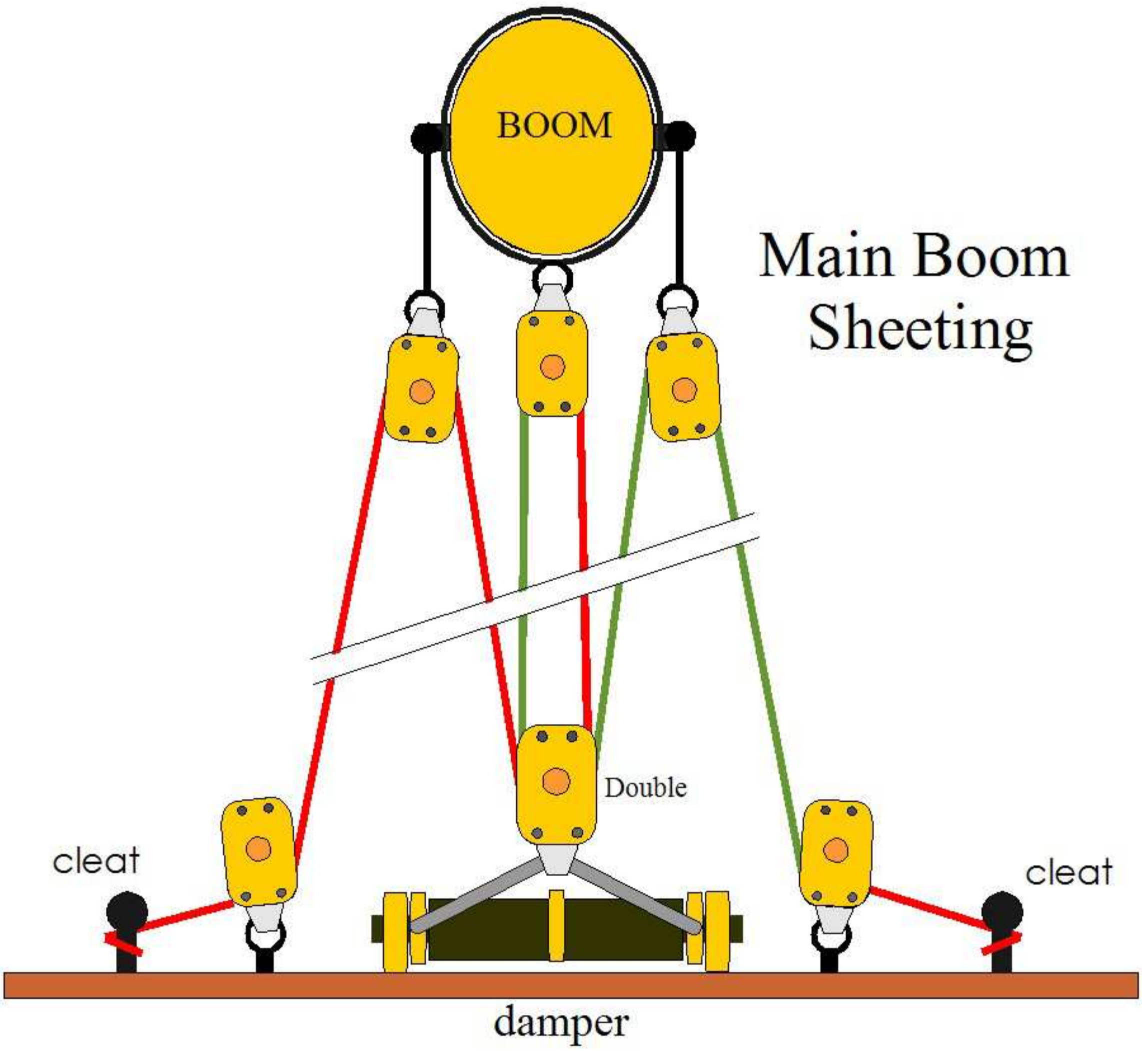
The real Tuiga Rudder

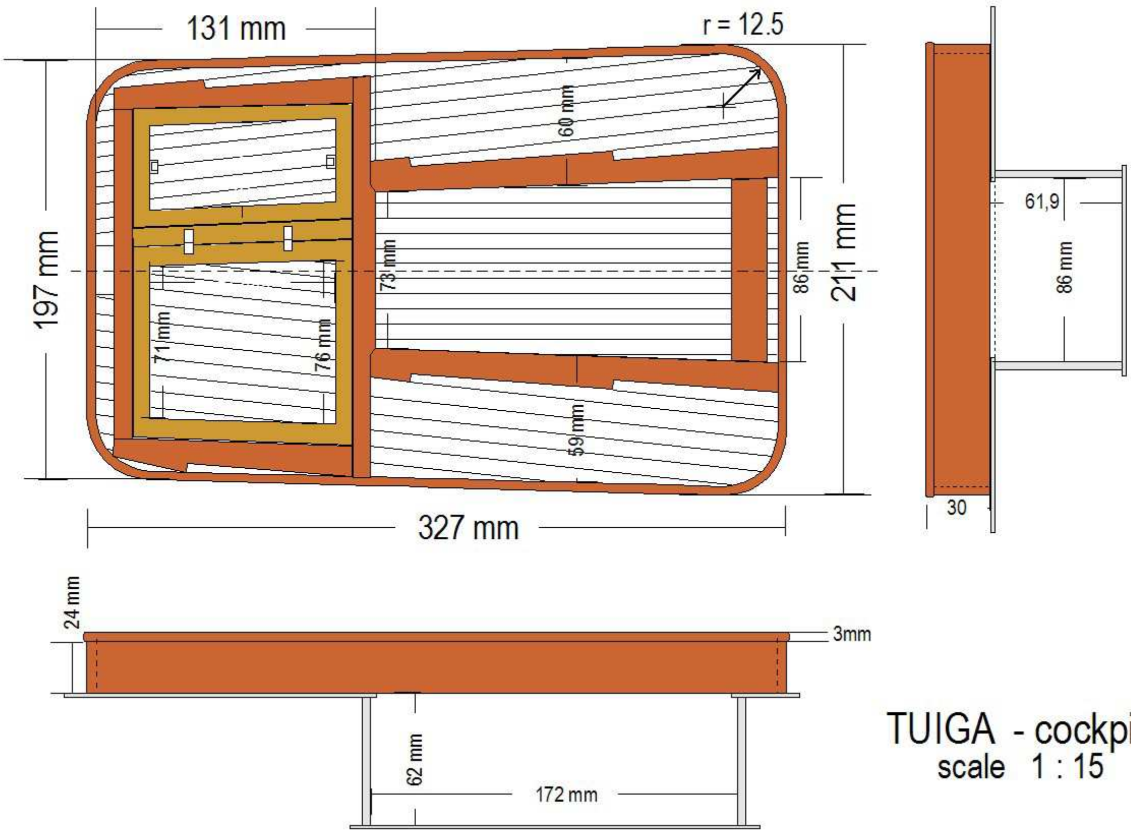

Rudder link
to servo


Tuiga
1909

The Winch

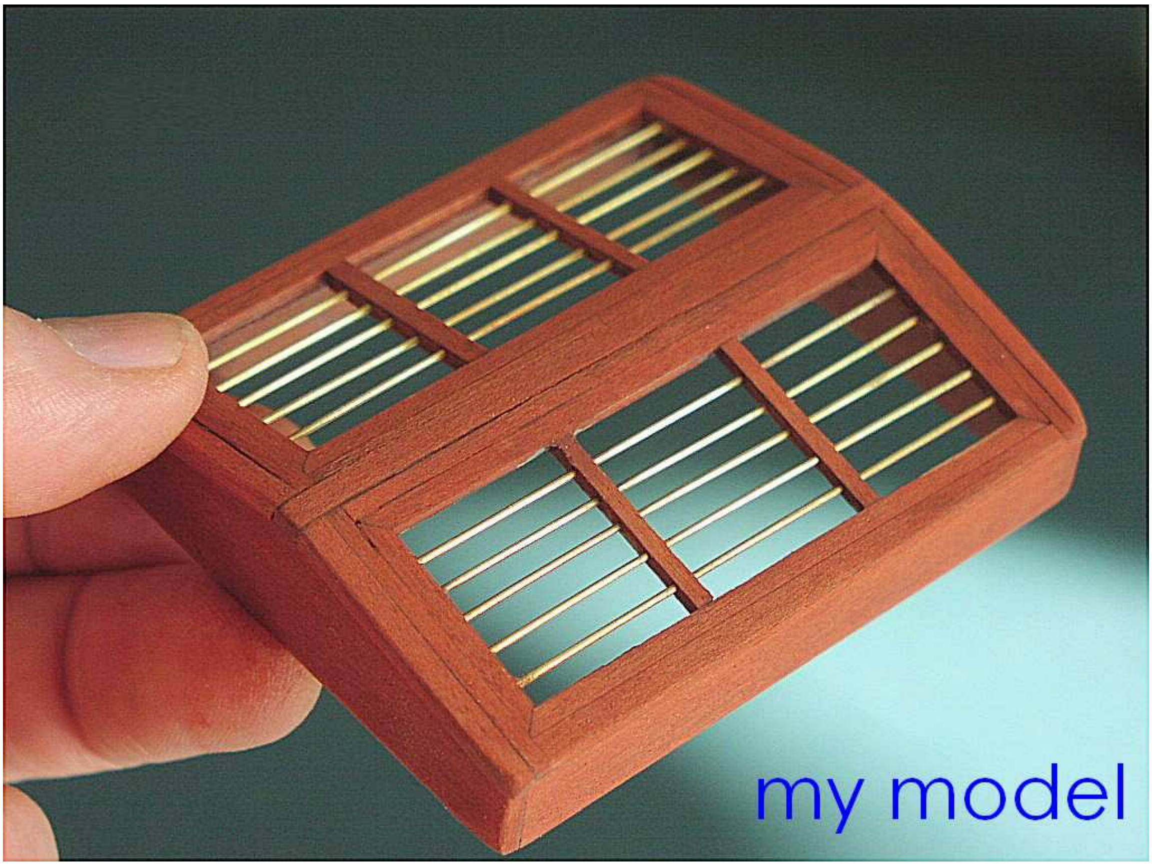
The Shrouds


BOOM
Main Boom
Sheeting
Double
cleat
cleat
damper



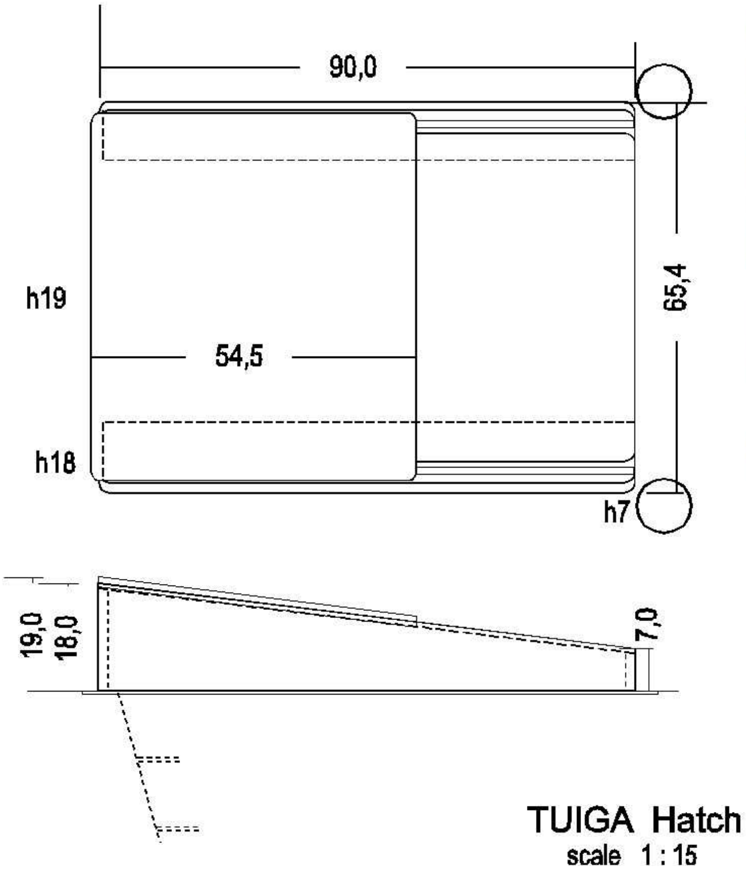
TUIGA - cockpit
scale 1 : 15

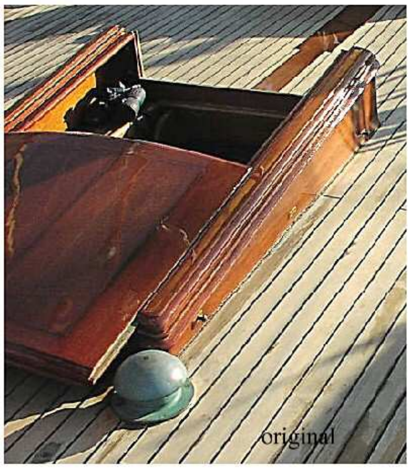
The original



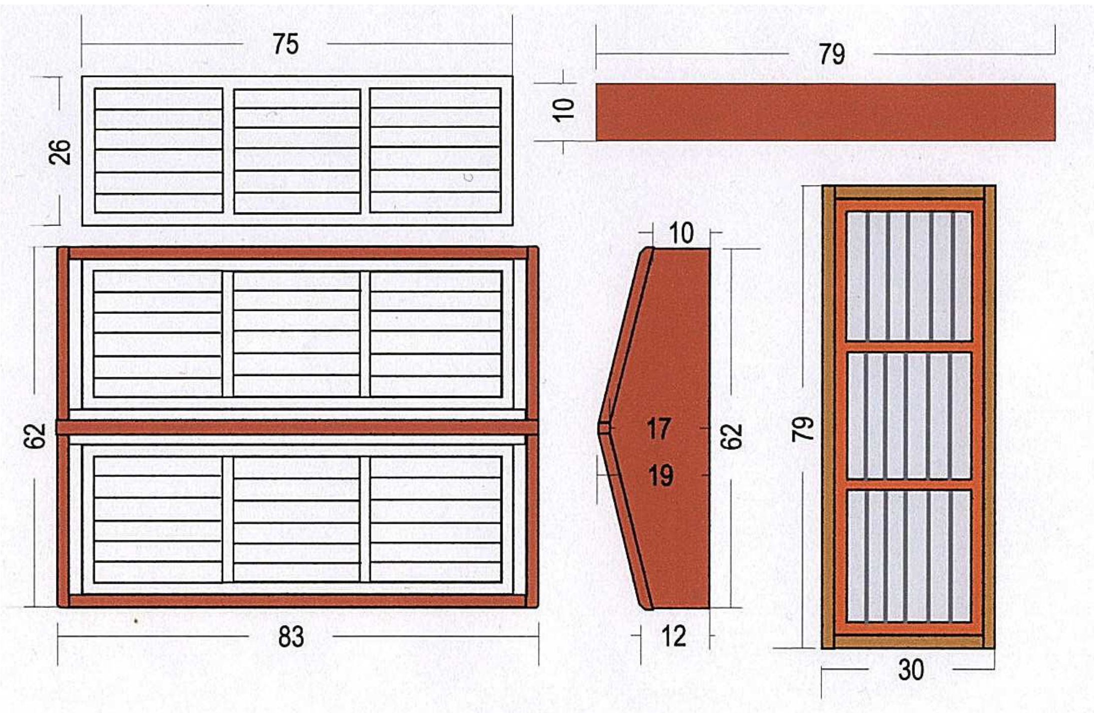
The model

The Original & the Model

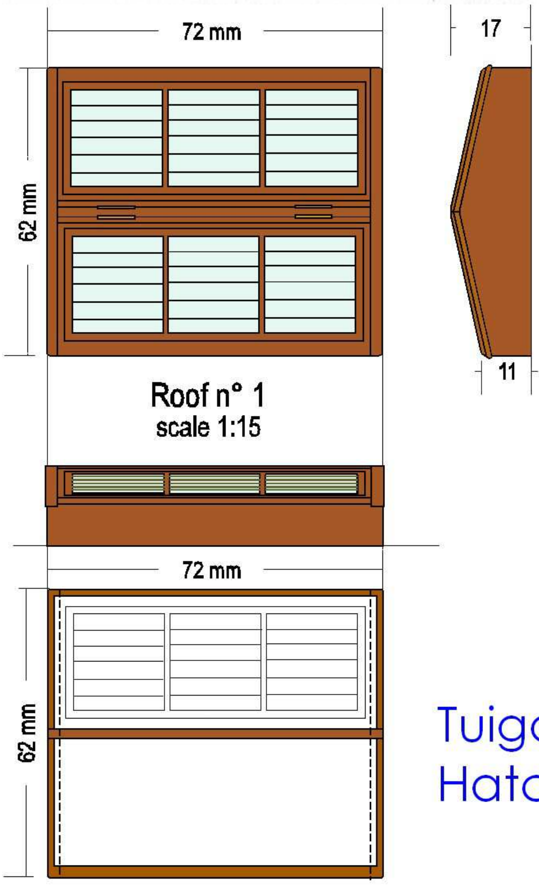


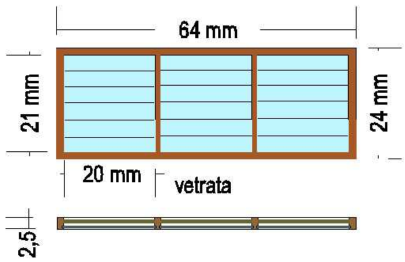


Each deck element was carefully measured



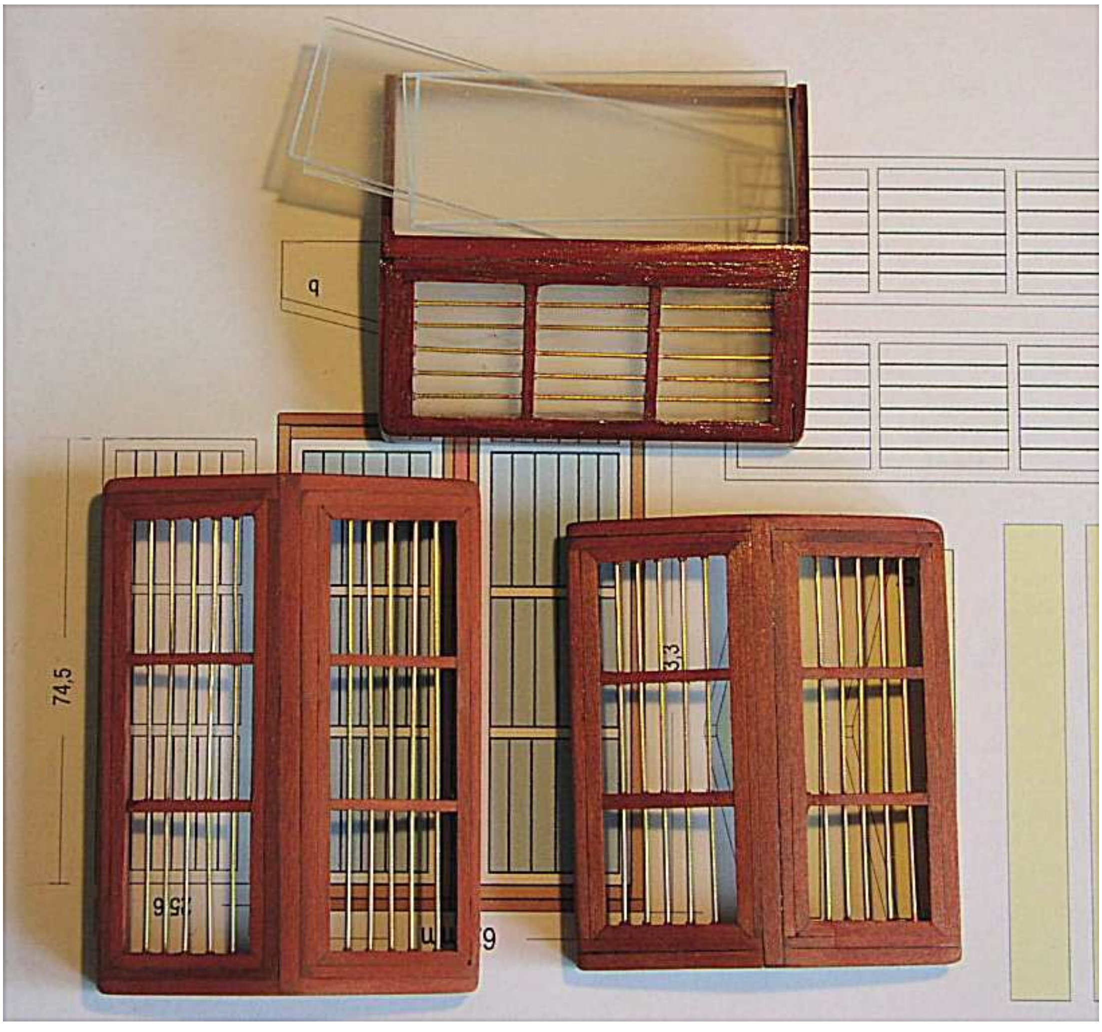
TUIGA Roof 2
ech. 1:15

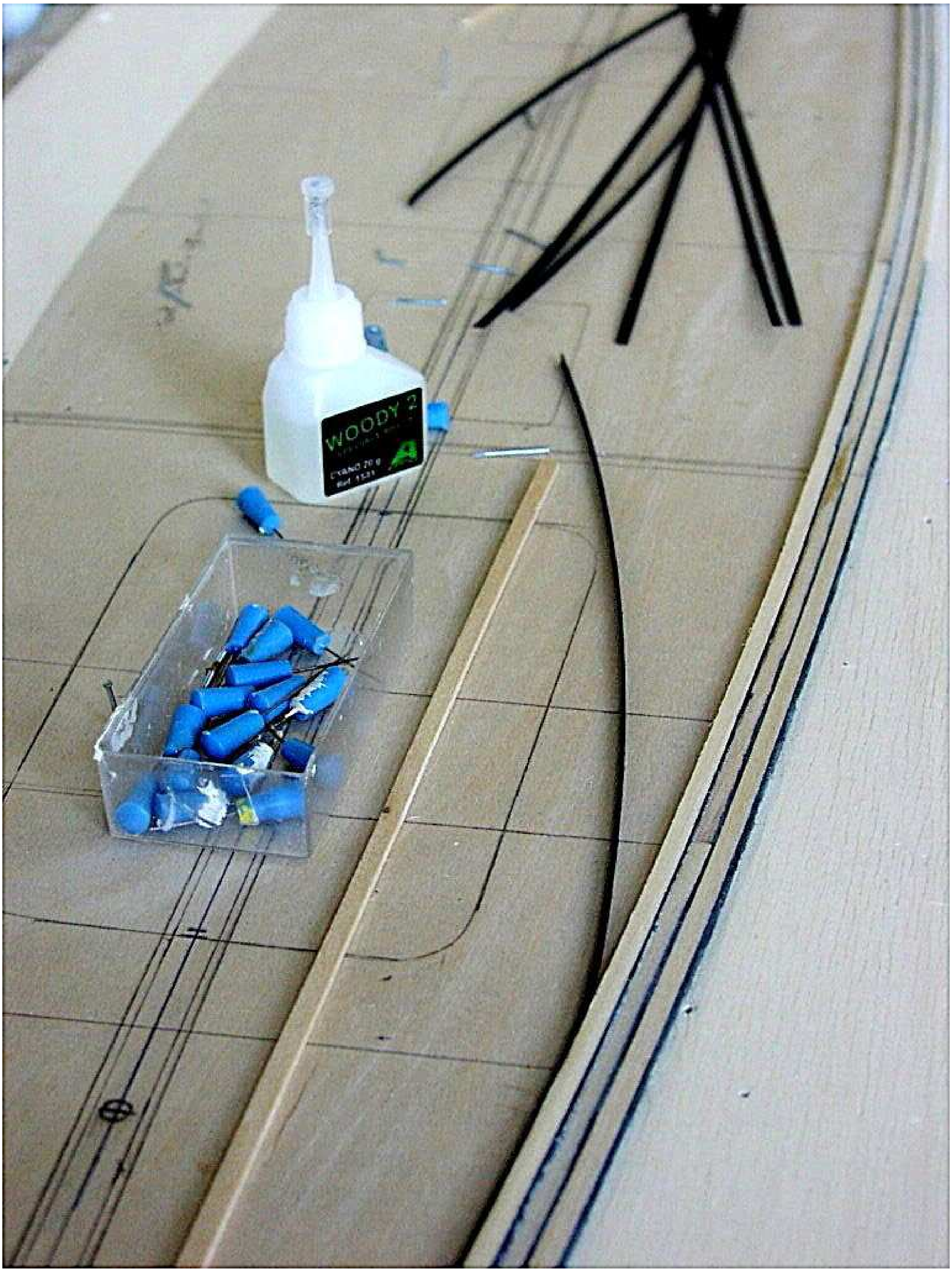


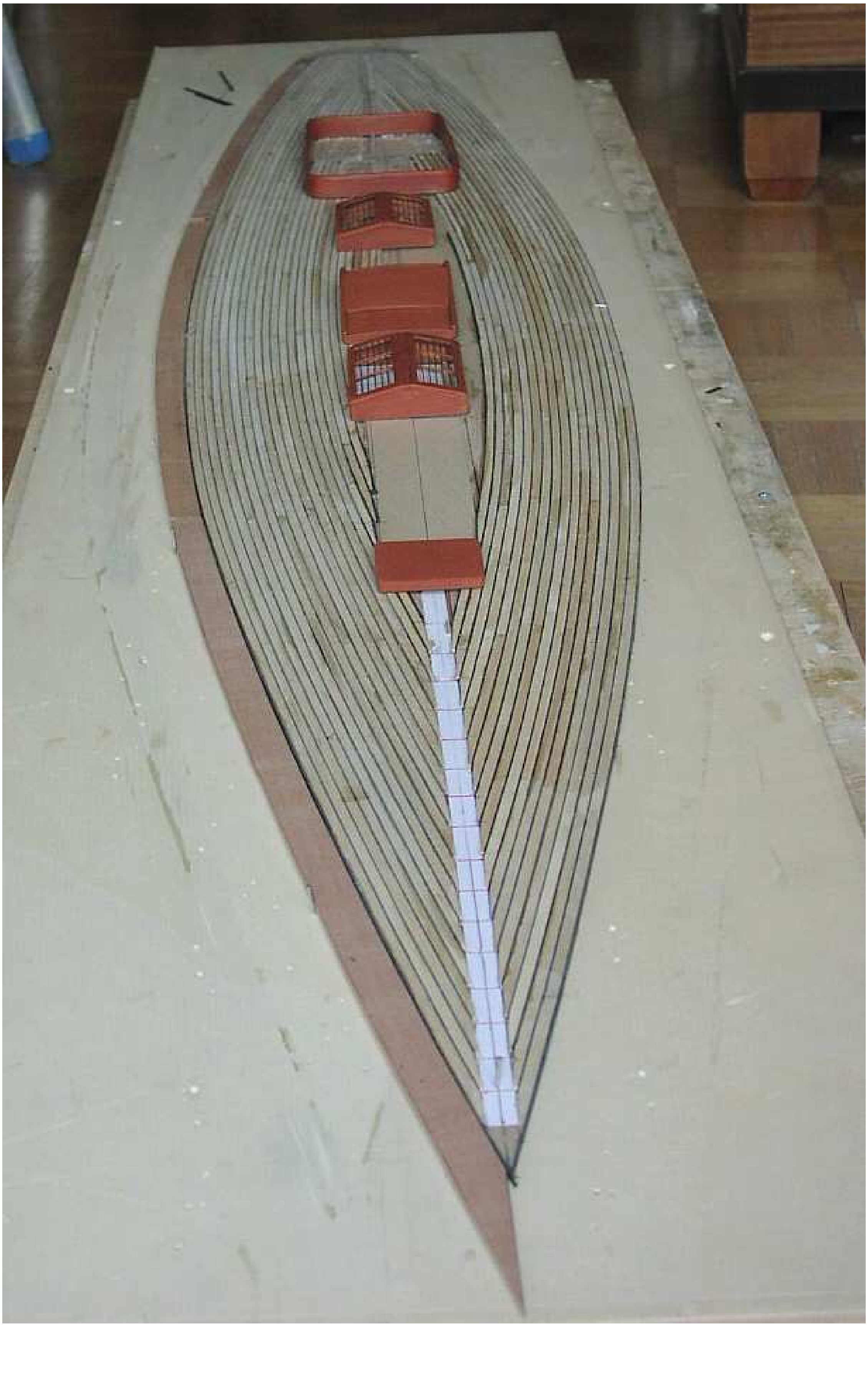


Tuiga
Hatch


Tuiga

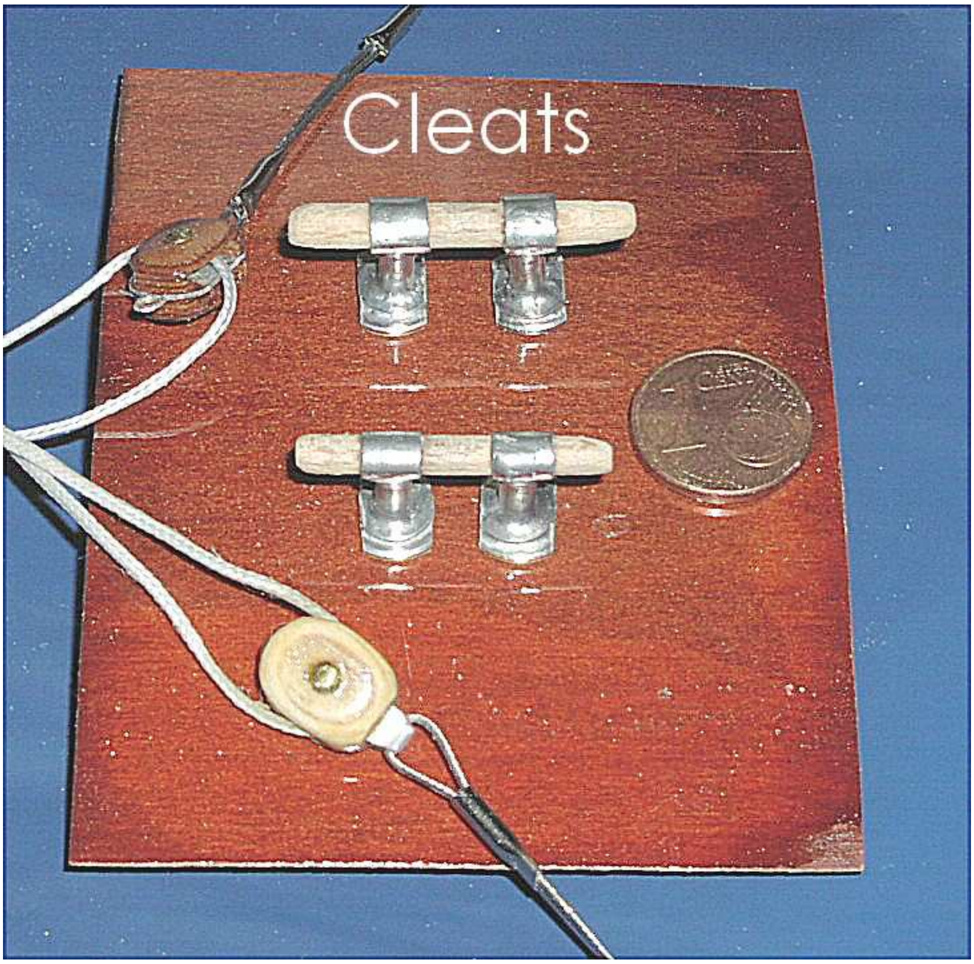

74,5


WOODY 2



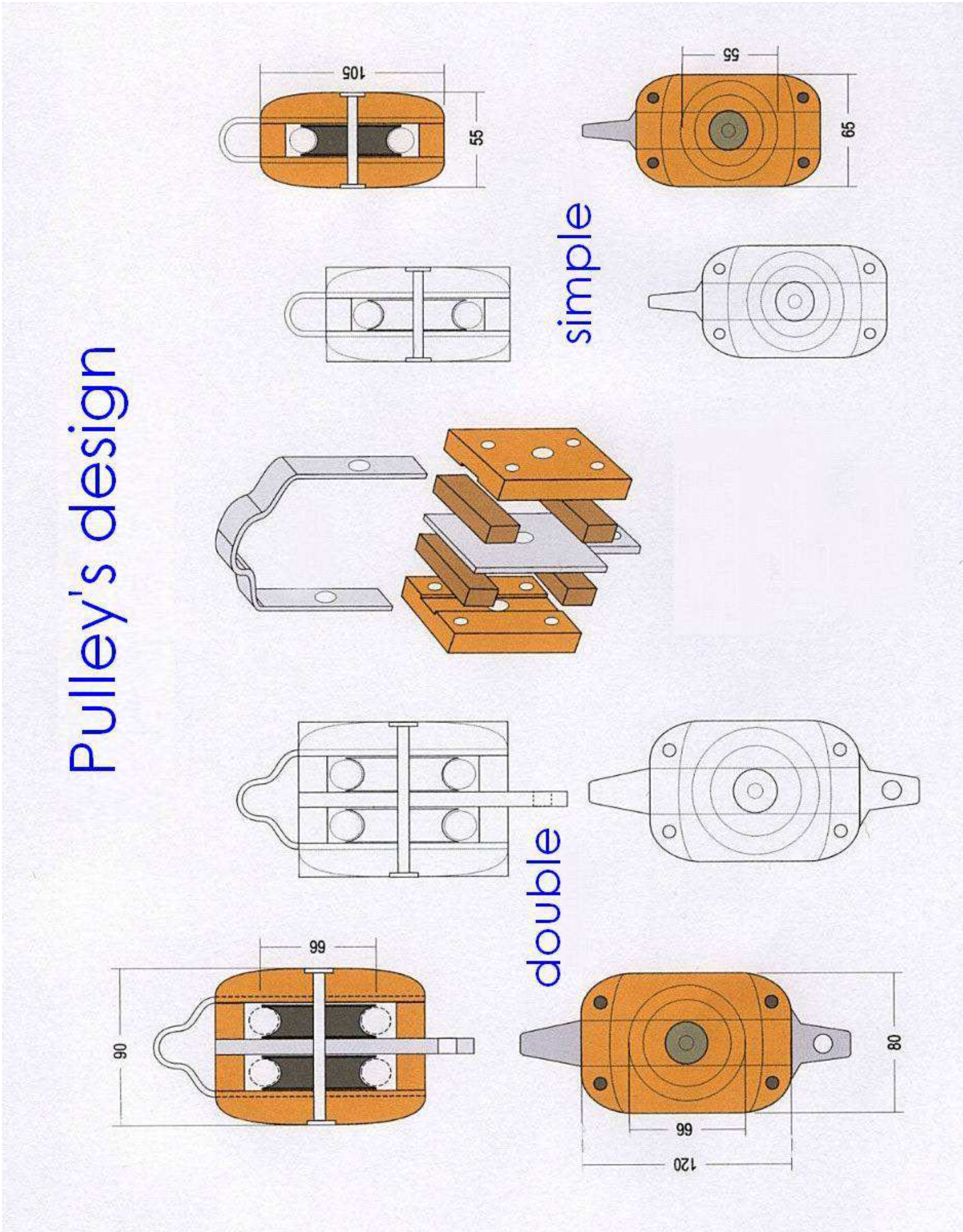
The Cleat parts

Pulley & Cleat samples



Fully functional Pulley

Pulley' drawings



The Tuiga Transom

Mini Freccia

This model is the result of a bet between couples of forum members.
One believed to make a RC sailing model of 30cm while my self I was of the opinion that could be done with half of that length.
It was 2006 almost 2 years before the Footy homologation.

At the end I was left alone to try …

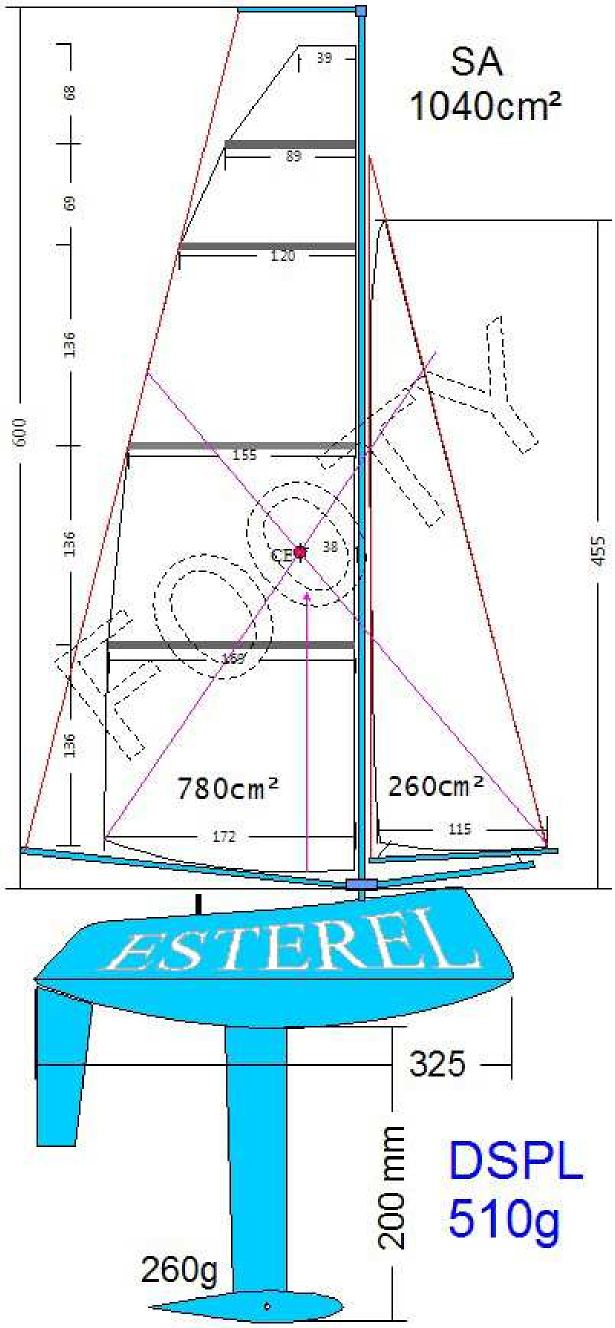
Two years later "Mini-Freccia" was awarded with the

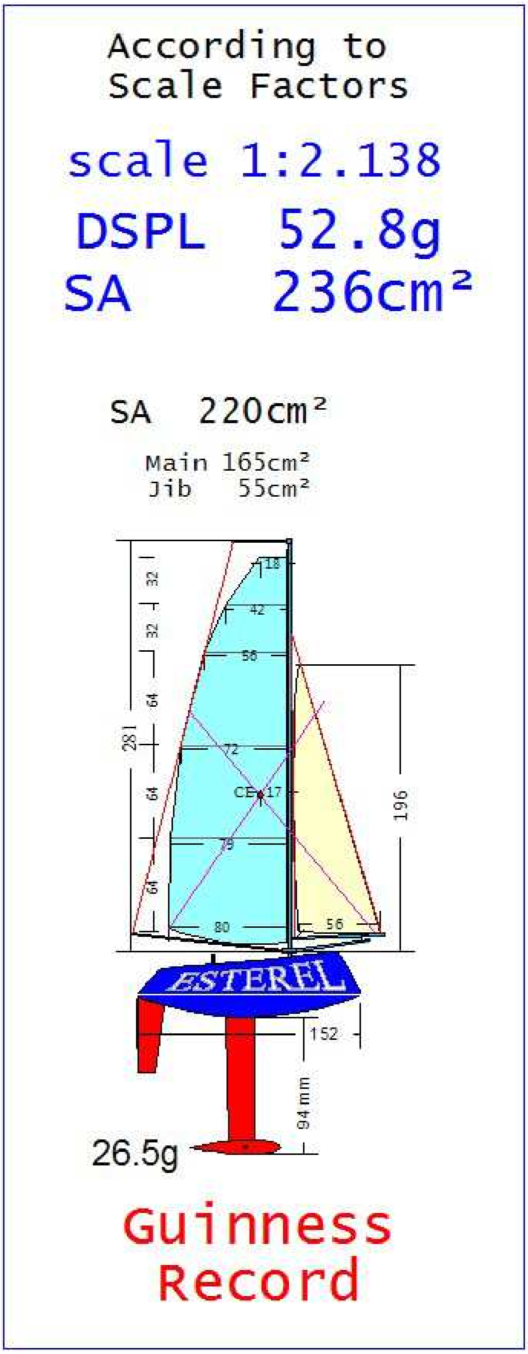
Guinness World Record

Here below the Footy Model of 305mm and the Esterel of 152mm.

Of course the scale factors are :

Linear size	as scale
Surface	Square of scale
Volume	Cube of the scale



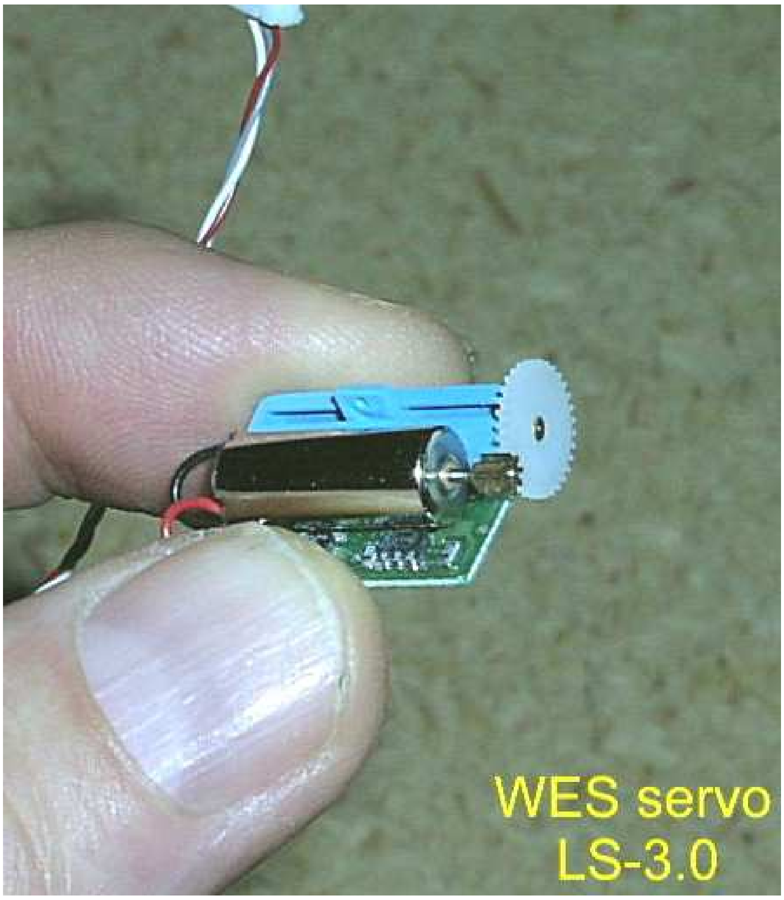


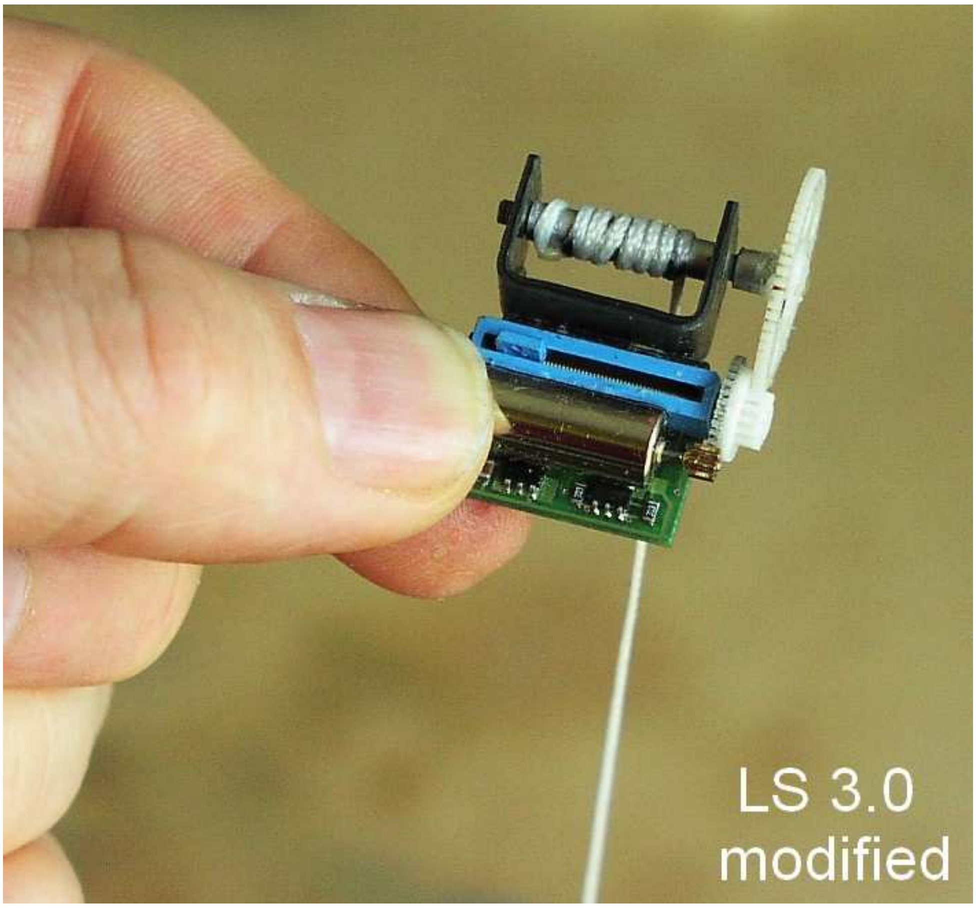
According to the previous view it can be observed that the model of 152mm length should have also 52.8 g for the Displacement and 236cm² for the Sail Plan.
Playing with the size of the model, the volume can be slightly increased by changing the Hull Draft or Width.

The first thing I did was to find out what the market was offering in terms of Battery and Servos being the most critical elements to define the final displacement.

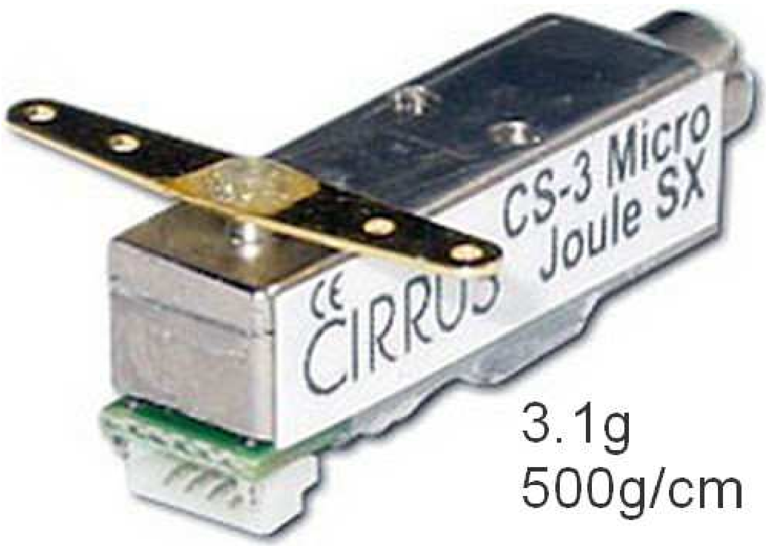
It was not excluded to make my own servo.
I can anticipate that, to avoid complications, I have chosen the Swing Rig with Jib surface of 25% of total area.

Searching around I found a small servo called LS-3.0 that I could use for the Main.

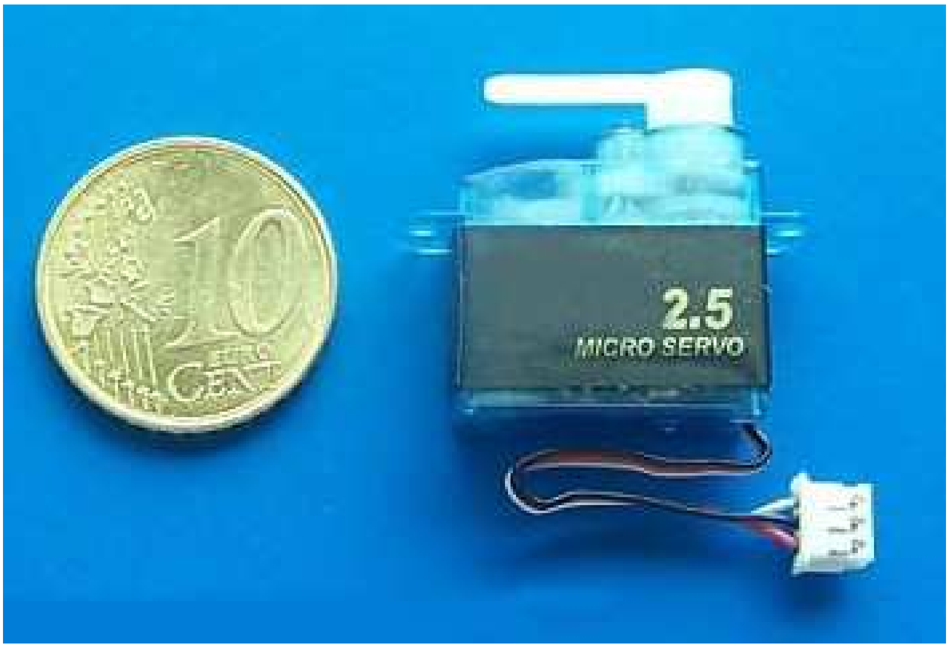


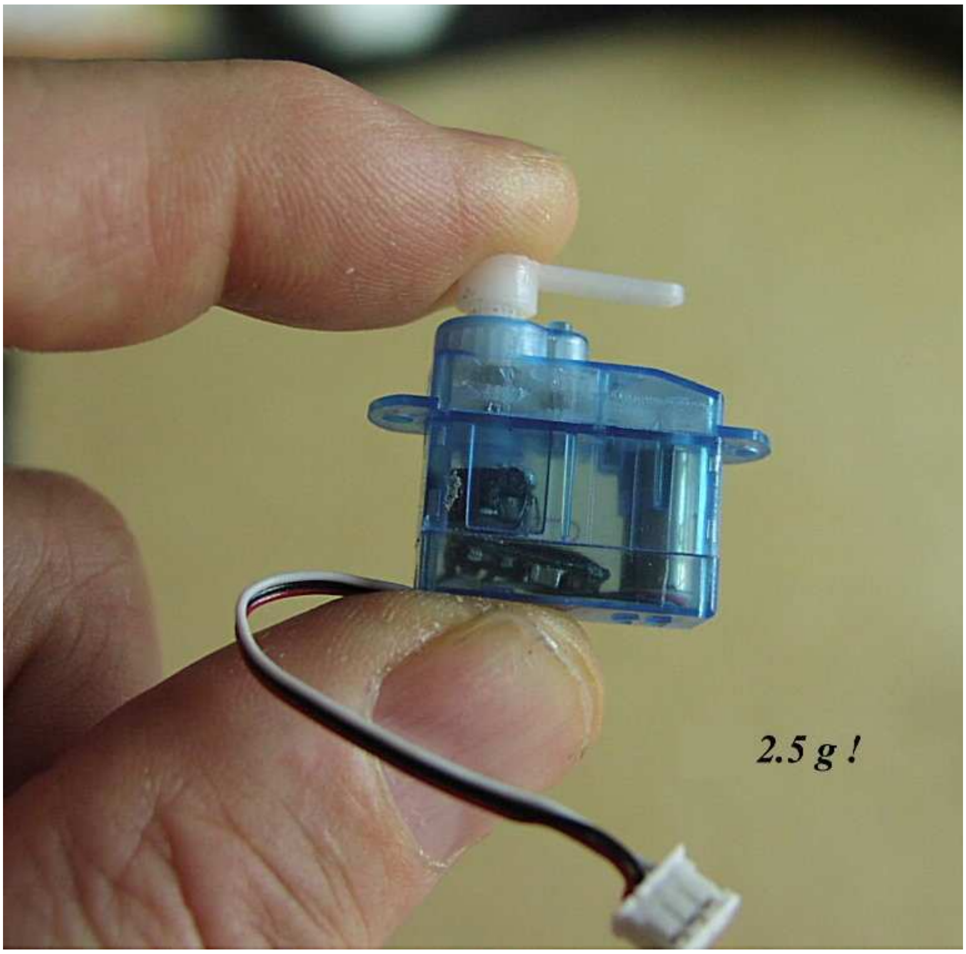


The WES LS-3.0 modified

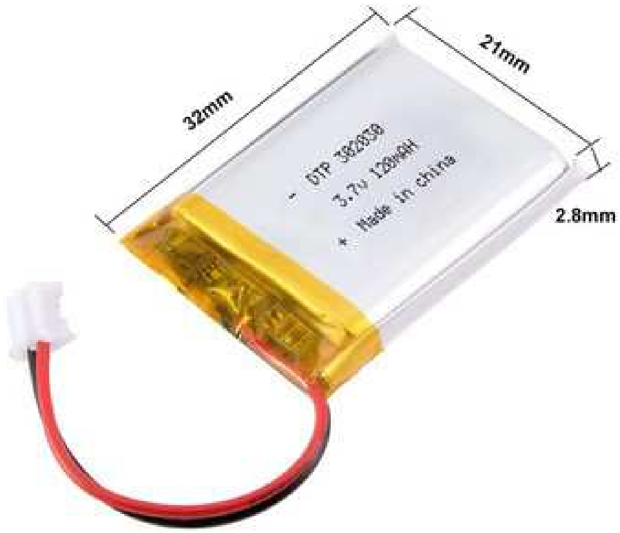


Another mini-servo the Cirrus

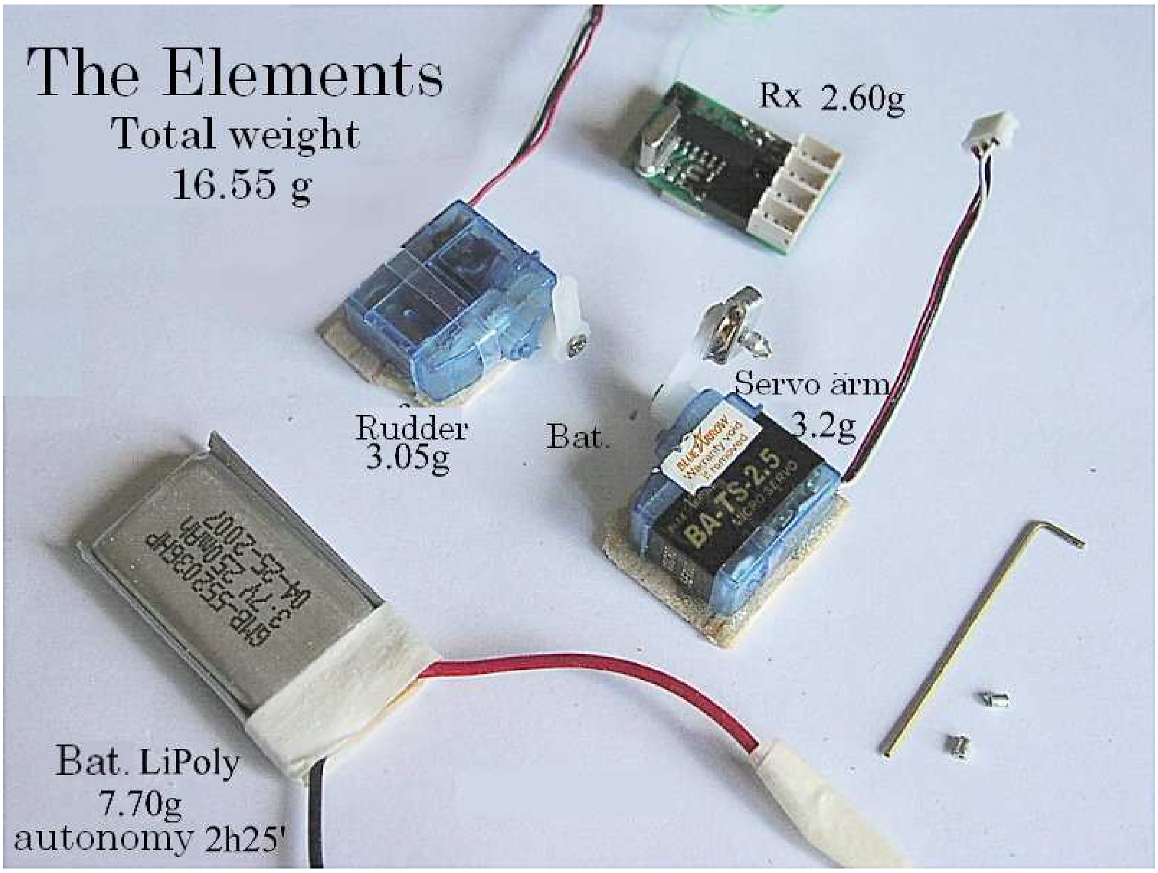




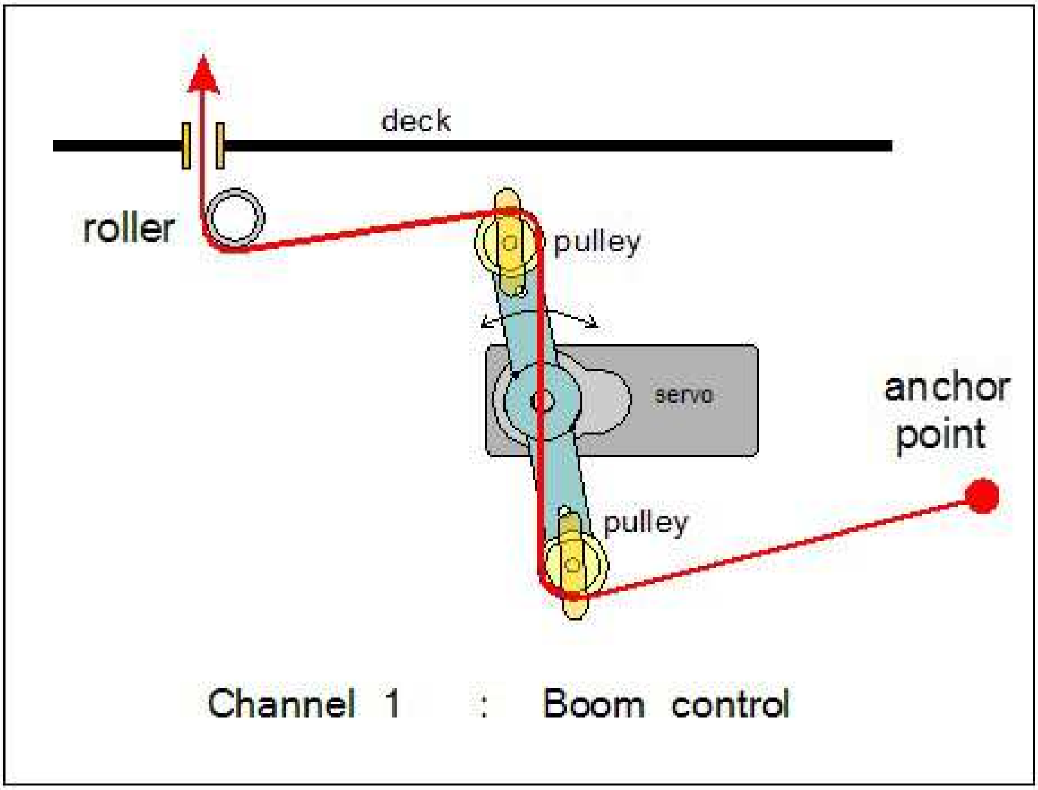
120mA/h – 3.7Volts

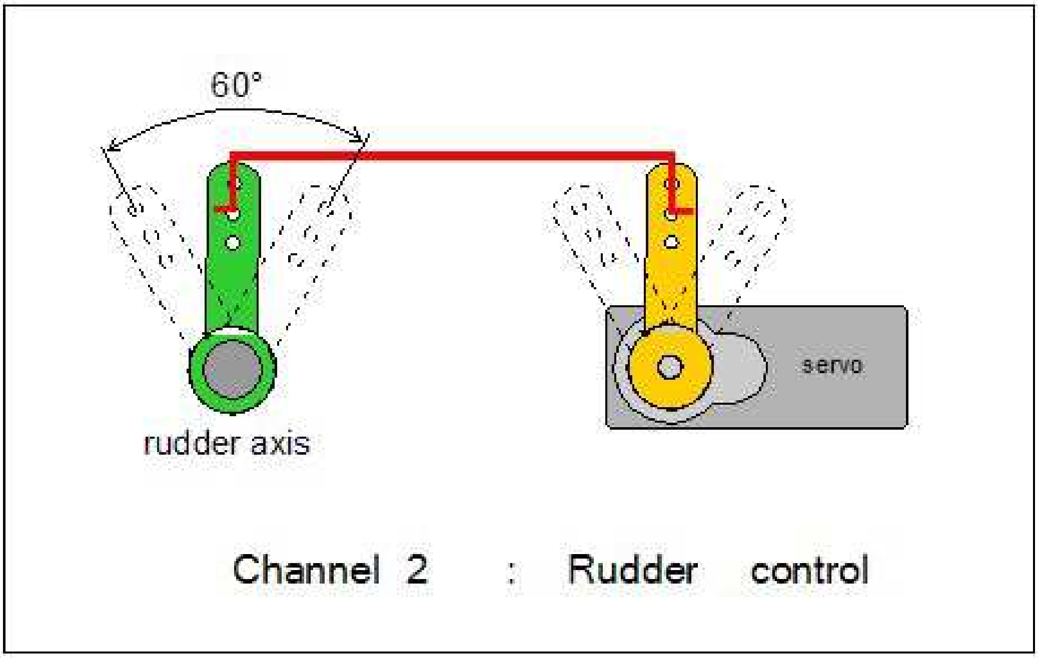


The choice was composed by the elements indicated in the picture below:



Onboard electronics = 16.55g

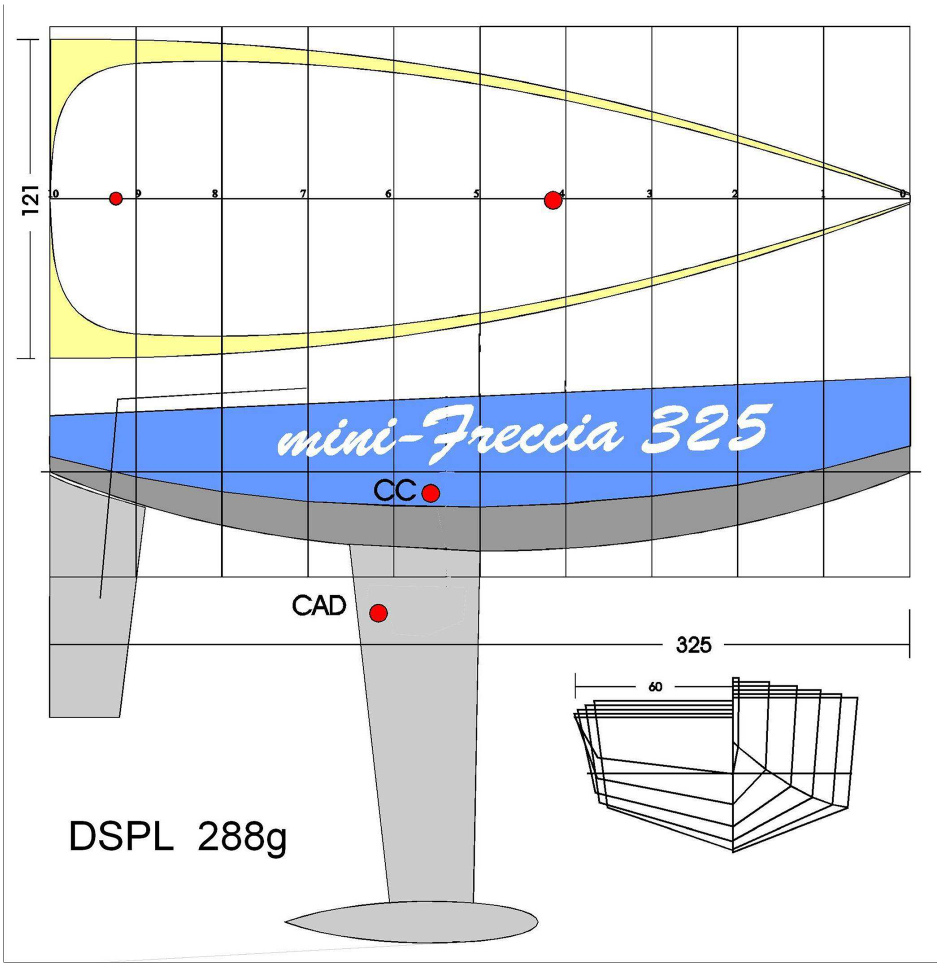




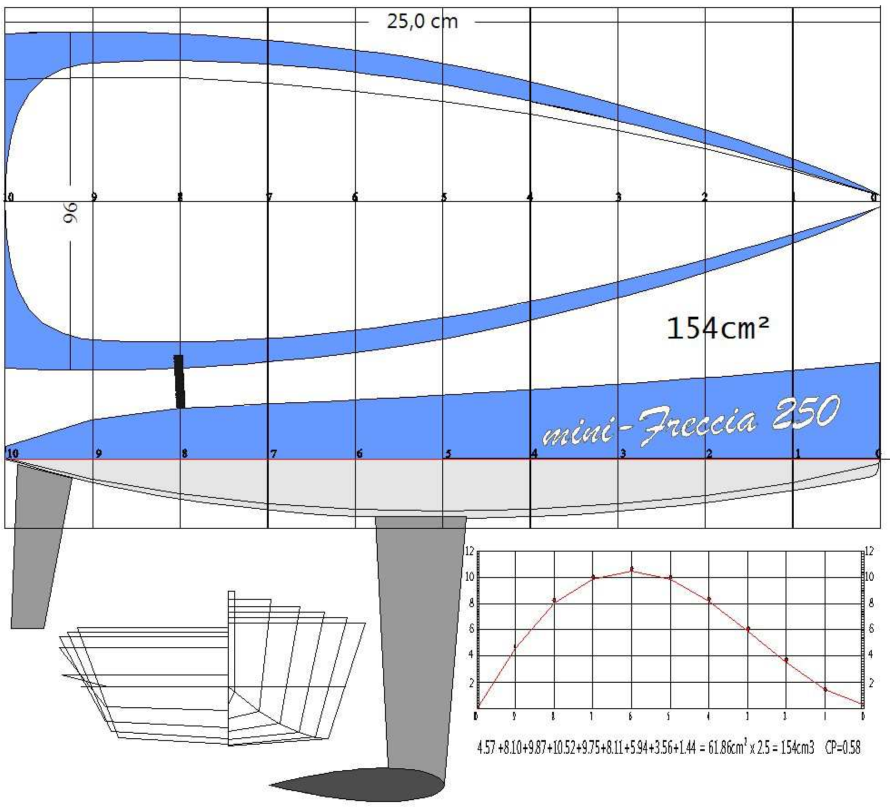
First drawing consisted in a design with LOA = 325mm
The COA analysis showed a DSPL (Displacement) of 288cm3.
Surely too large for the purpose!

It is evident that a model of 325mm length is not in line with the desired dimensions as indicated at page 2.

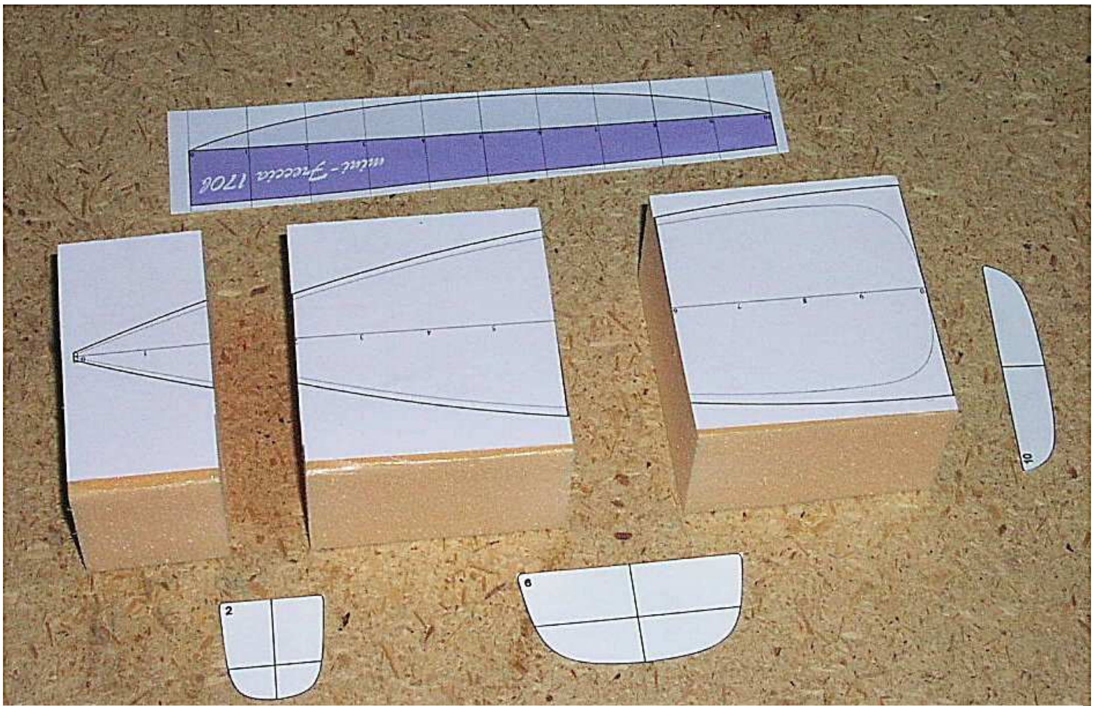
325mm basic block hull before smoothing

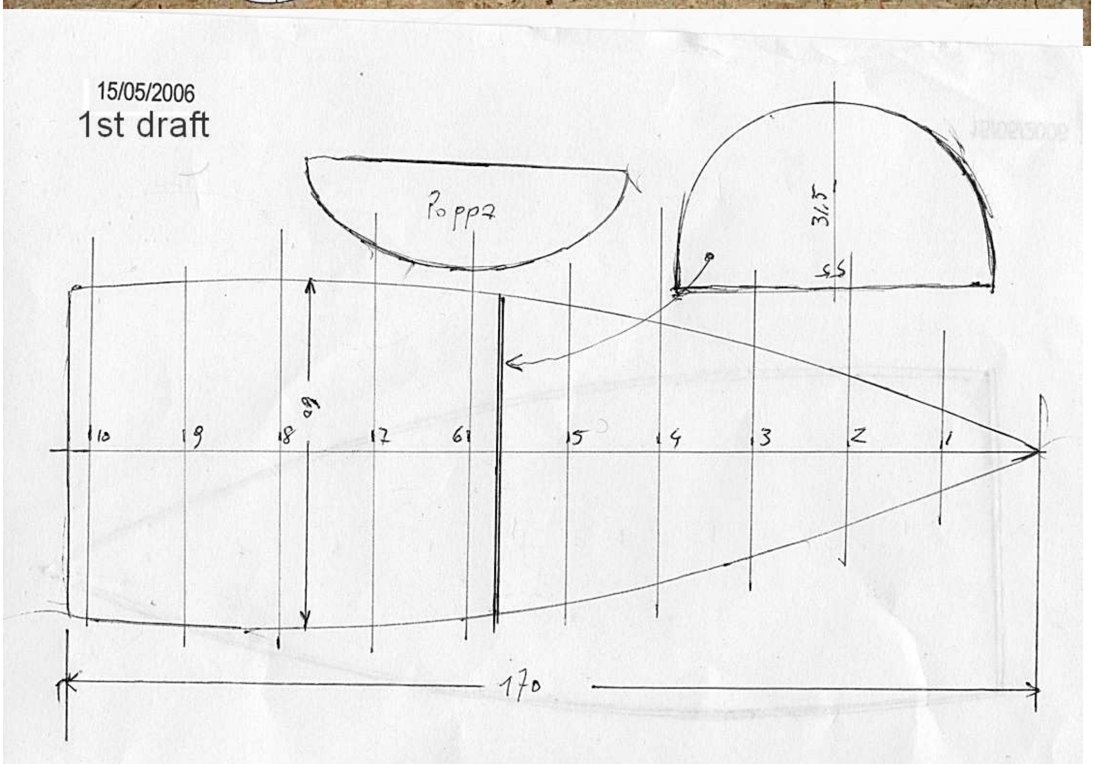


The second trial was a replica of the first one but with shorter length down to 250mm



The Displacement went down to 154cm3, still too large!
The third trial was a sort of reverse engineering method where I used a piece of Polystyrene block and shaped freely by hand as such to give a sort of hull form.
The block was then cut in three sections in order to have an idea of the section shapes
This block was 170mm long

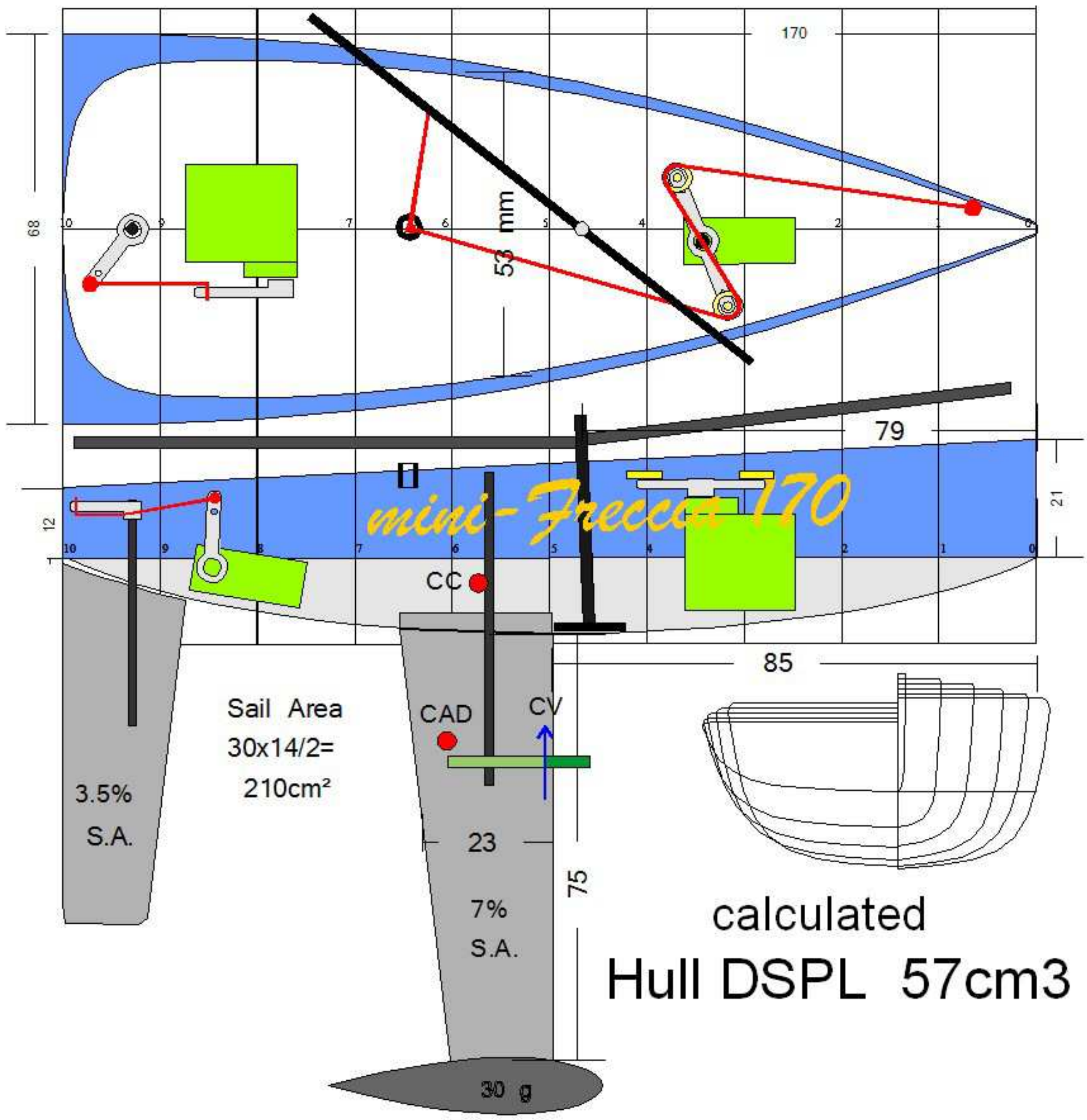




Retraced/copied the section cut forms

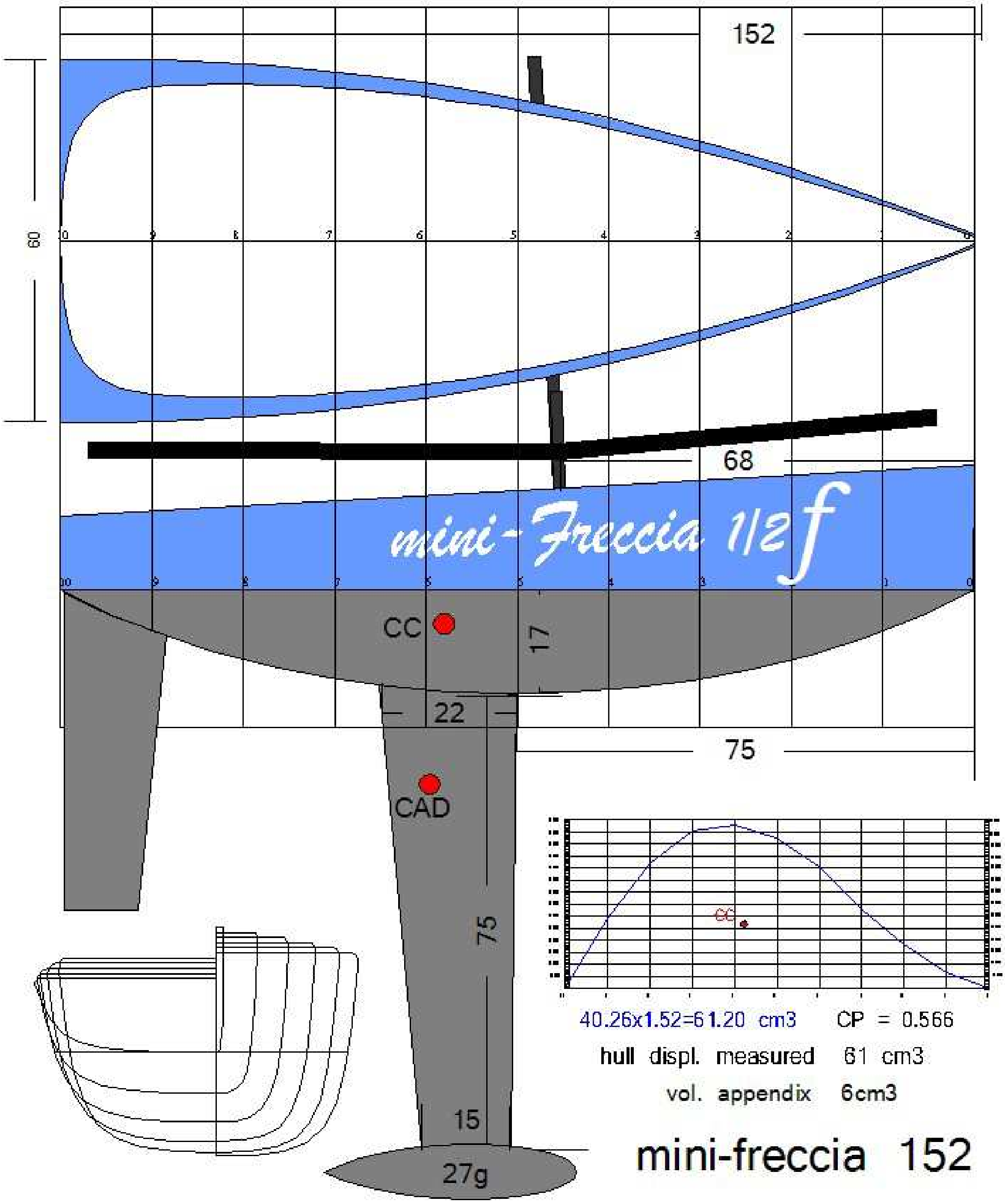
Following the retraced section I have shaped a new Hull of 170mm lenght

Rebuild of a new 170mm hull shape according to previous cut



Observing the Data it can be seen that the calculated Displacement is not far from the 52.8g (page 2)

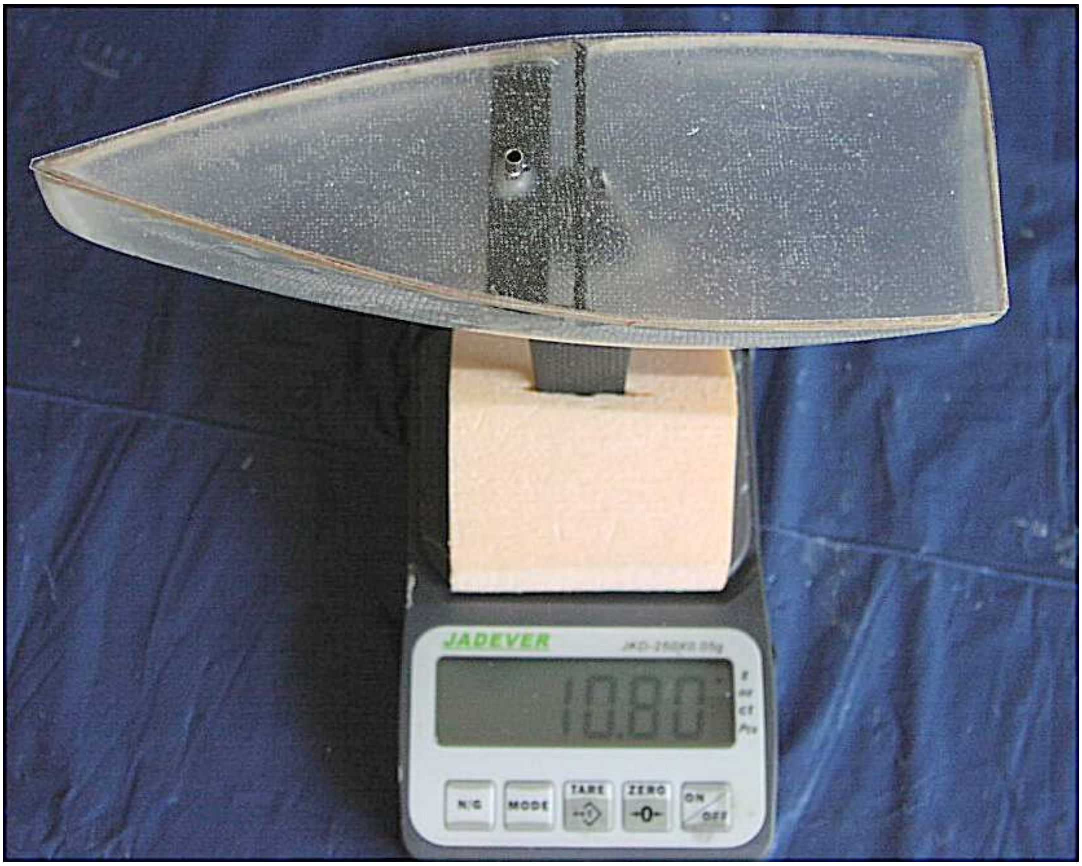
Summing up the weights of various elements needed, I have slightly shorten the length and increased the Hull Draft



This drawing should represent the final design.
In the following pages some images of the practical work done.

The mold

Hull weight 4.7g

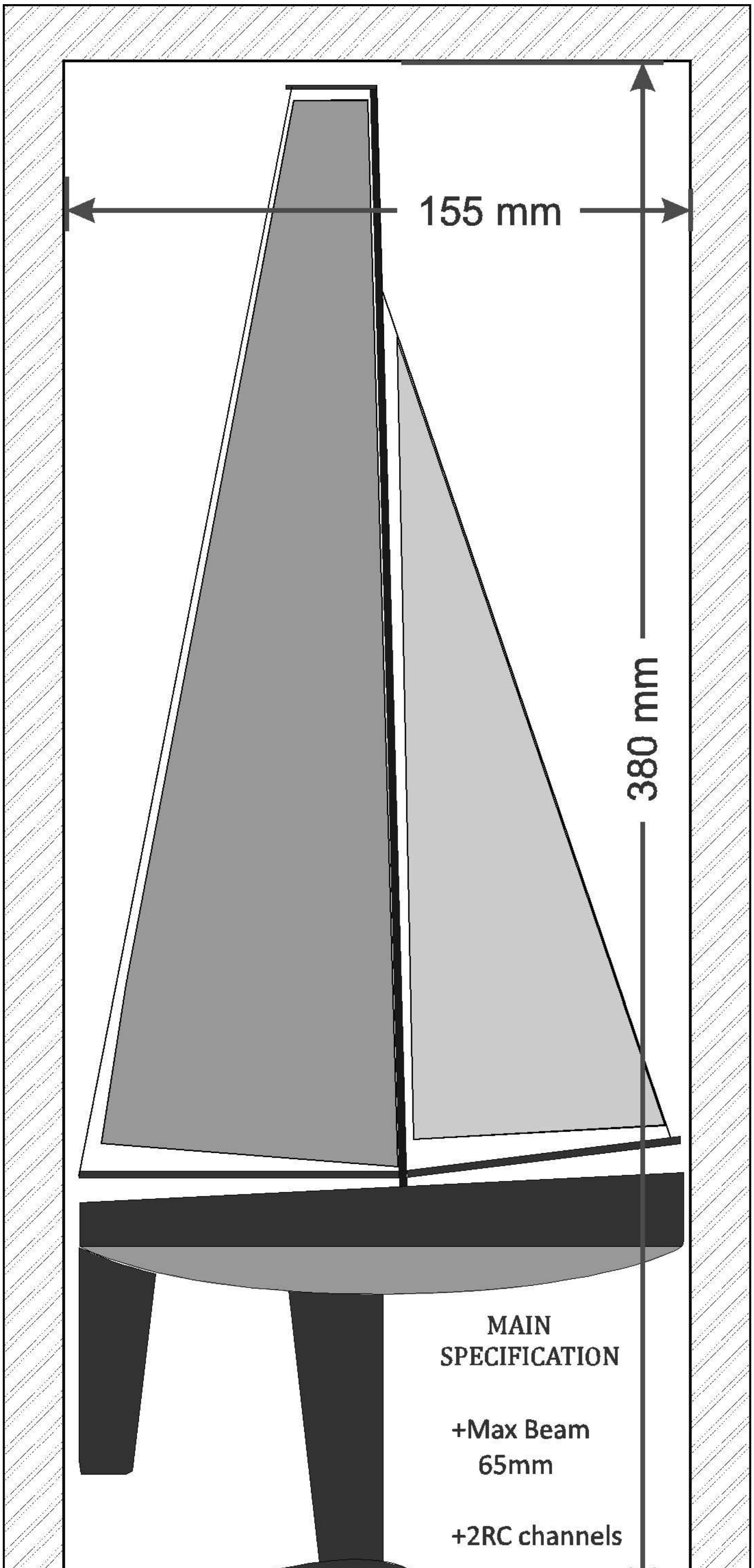


Hull and Deck weight 10.8 g including wood stringers

	Weight	Volume
Hull	10.80 g	
Rig	6.50 g	
Fin	5.00 g	2.2 cm3
Rudder	3.50 g	1.6 cm3
Bulb	28.00 g	2.5 cm3
Total	53.80 g	7.2g total volume
Total DSPL	**53.8 + 7.2 = 61g**	

The Mini-Freccia


1/2 f


155 mm
380 mm
MAIN
SPECIFICATION
+Max Beam
65mm
+2RC channels

THE BOX RULE


one of the witness


1/2f
mini-Freccia


GUINNESS WORLD RECORDS

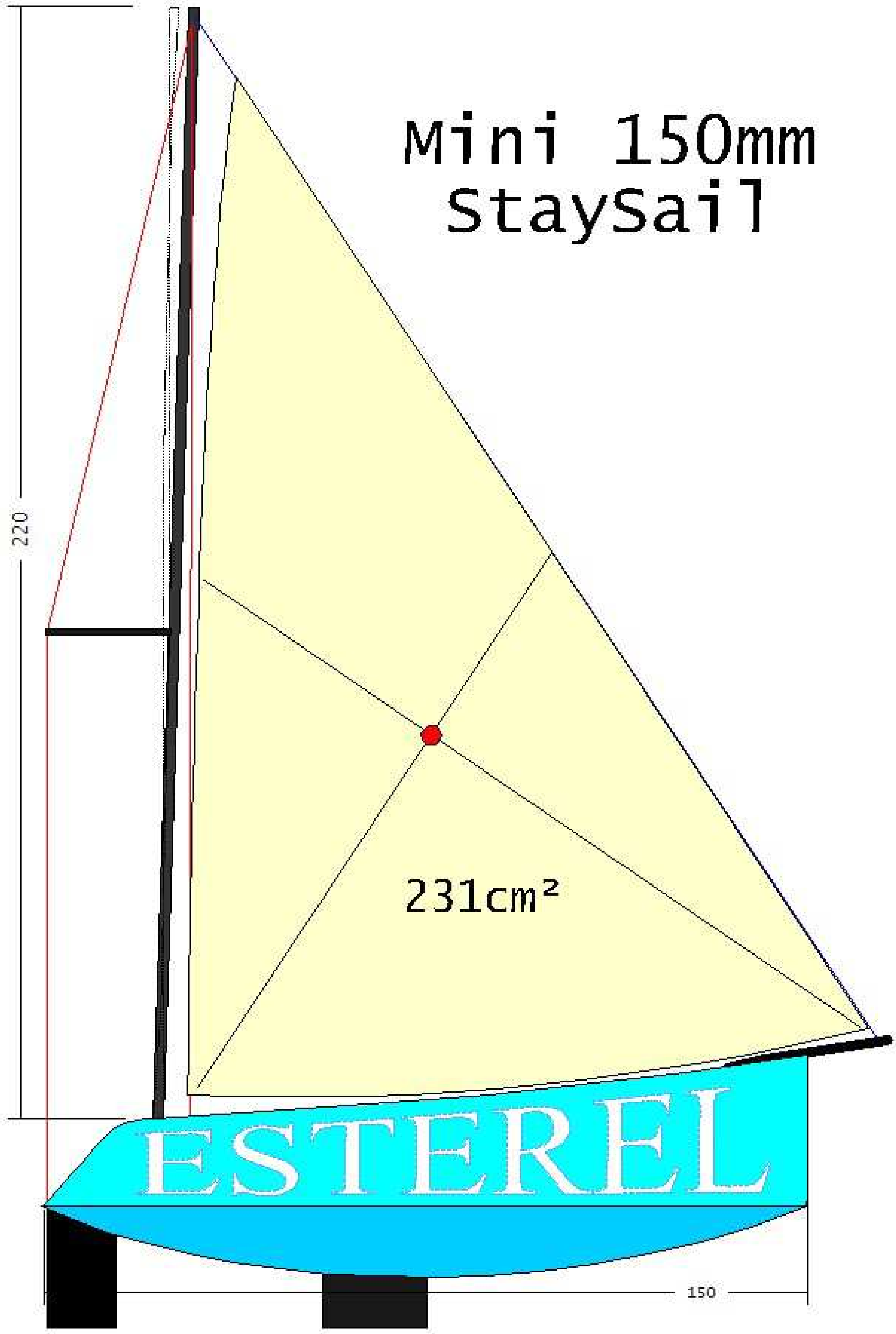
CERTIFICATE

The smallest radiocontrolled model sailing boat is 15.2 cm (5 in) long, 6.3 cm (2 in) wide and its hight including mast, keel and bulb is 38 cm (1 ft 2 in). It was build by Claudio Diolaiti in Nice, France and was tested and measured on 14 November 2007.

GUINNESS WORLD RECORDS LTD

www.guinnessworldrecords.com

The Record!



Future development could make use of the Staysail configuration…

FOOTY

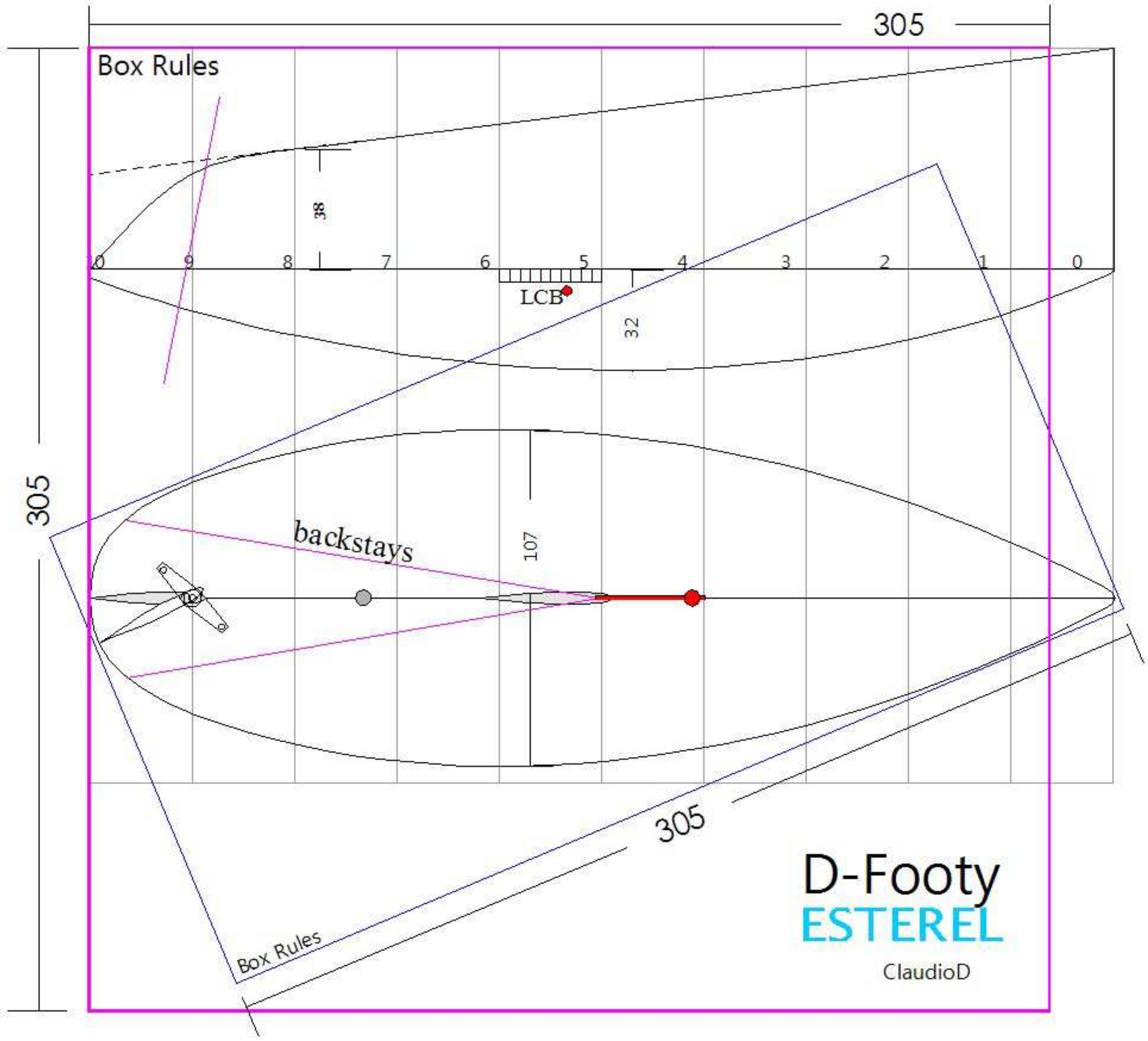
The Rules are rather simple with the use of a Box

https://footy.rcsailing.net/footyrules_2009.pdf

After the satisfaction received from the "Mini-Freccia", it was not my intention to start to get involved with another mini model.
It happens that a friend of mine went asking to design a Footy for him, as was the case before with the IOM Class.

I decided to play this game and drawn a Footy.

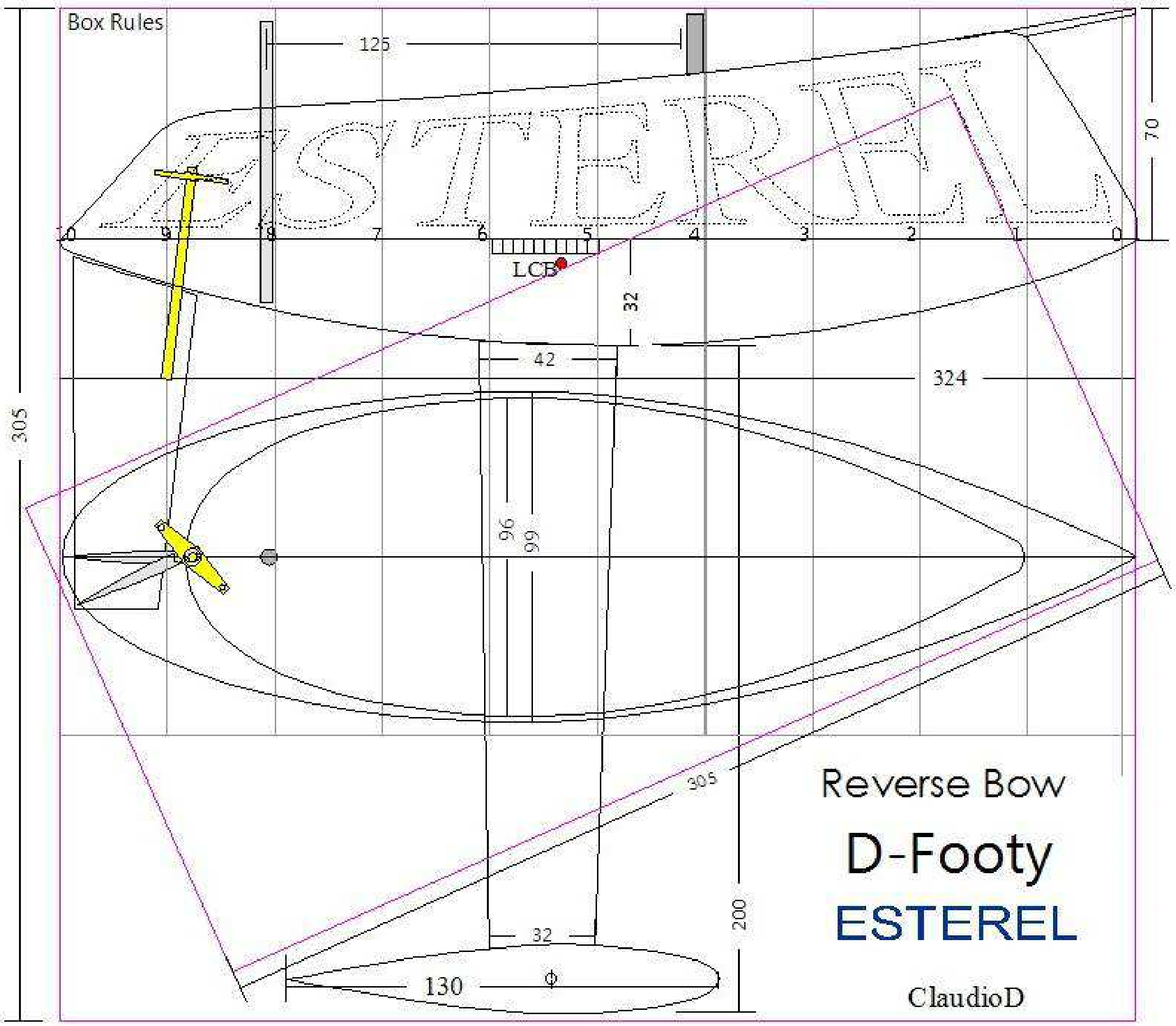
Let start with the basic plan where the max length shall be 305mm unless the box diagonal is used.

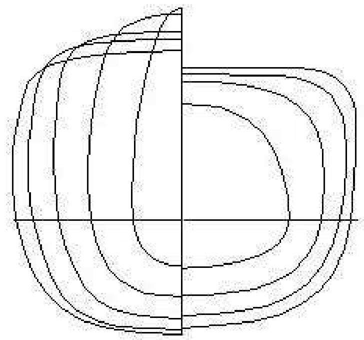


The initial design for Footy Esterel uses the diagonal dimension as such that the hull length is 325mm instead of 305.
I'm not sure that this option will pay, but is taken!

As can be observed the transom is inclined, but in the next page the new drawing also show the reversed bow.

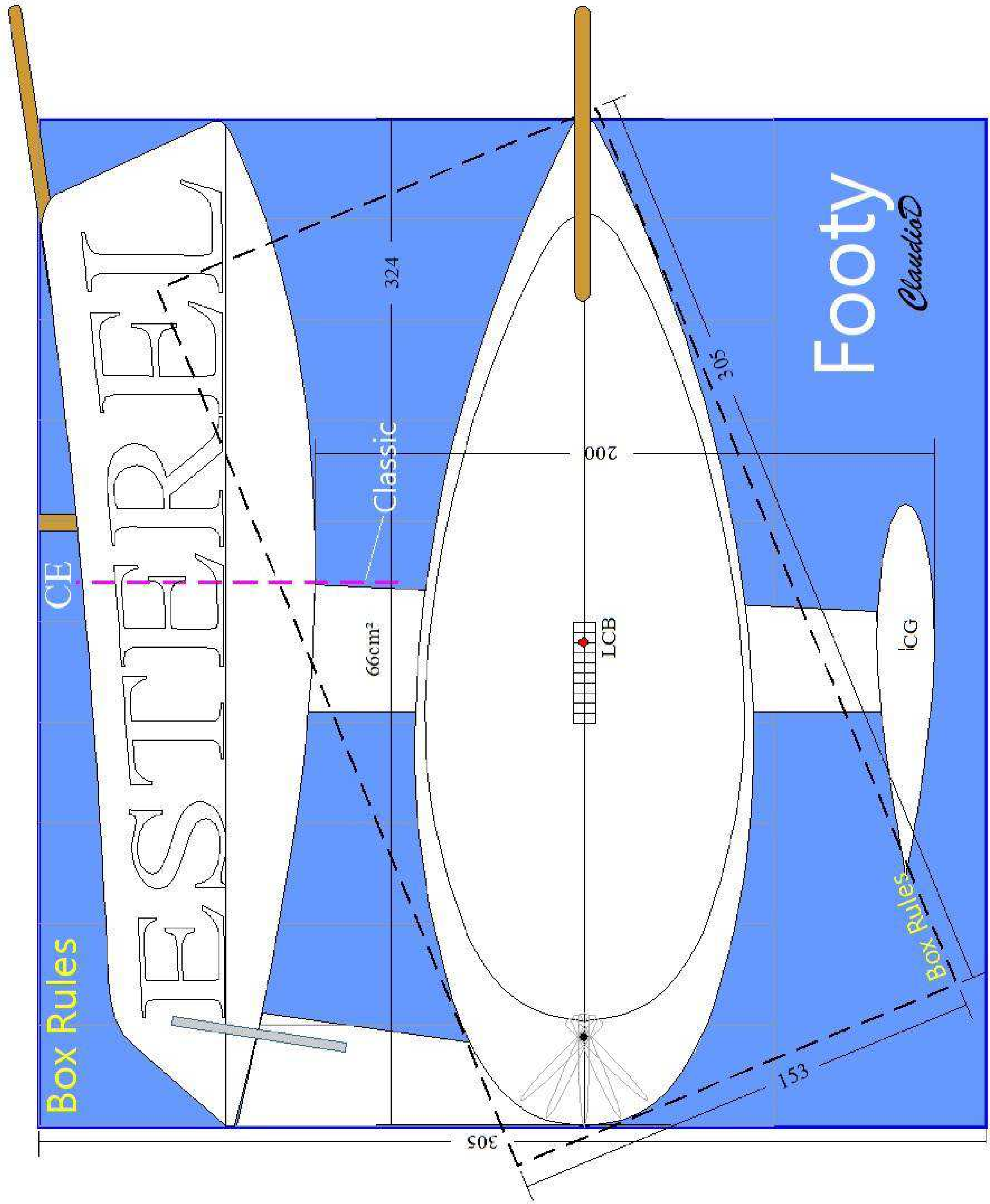
In my mind this decision is taken in order to reduce the overall hull weight





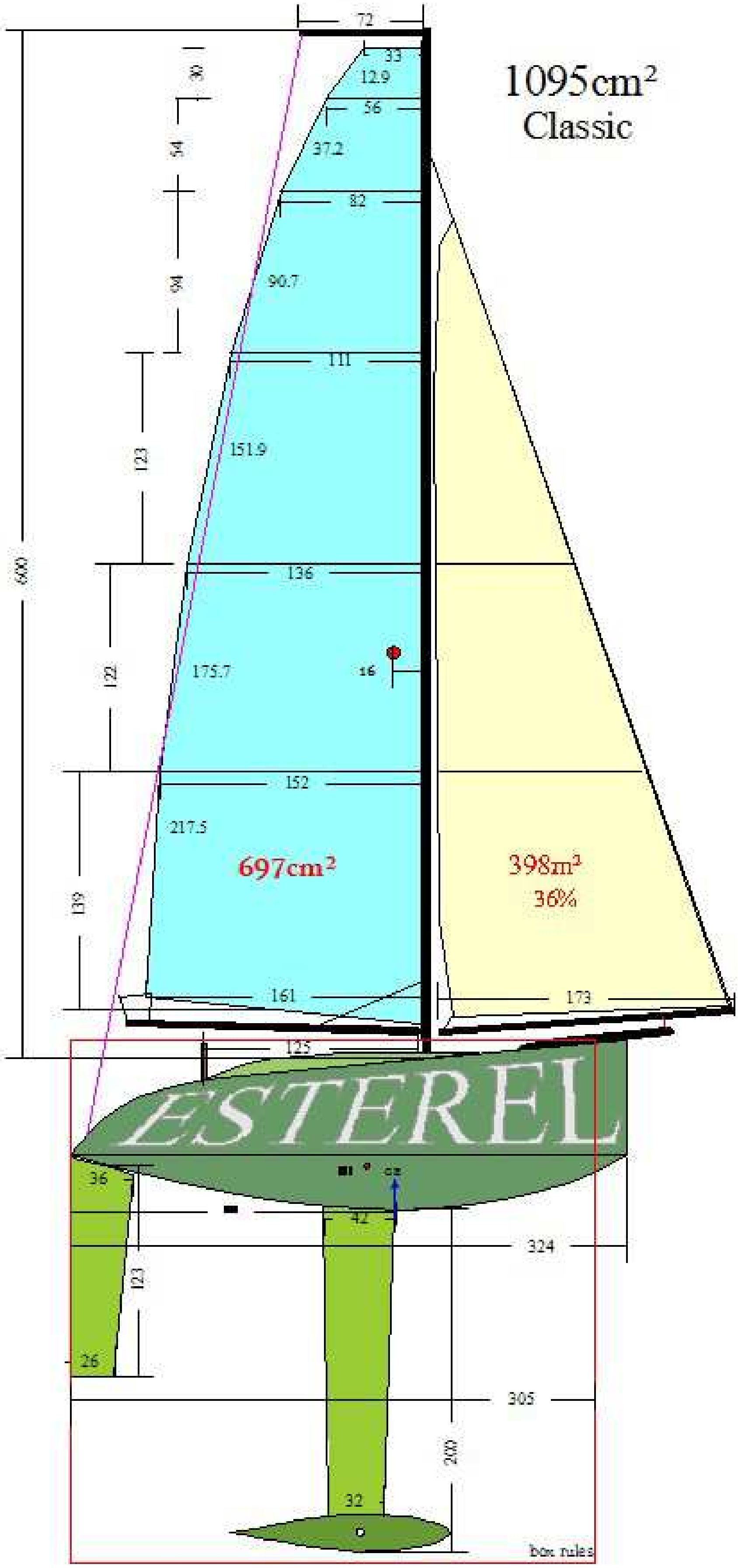
Budget

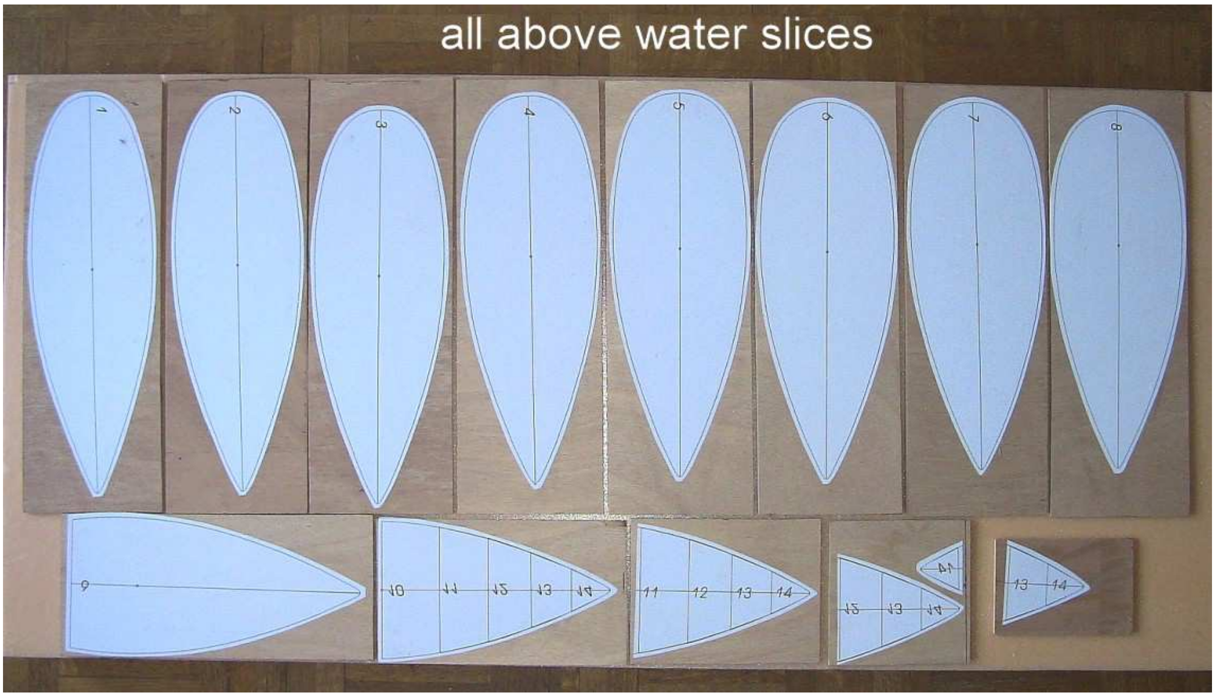
servo HS-85MG	22g
servo HS-65MG	12g
bat. 800mA	55g
Rx	10g
box	10g
Total	109g
Hull/Deck	40g
Rig	25g
Fin	25g
Rudder	5g
Supports	30g
Total	234g +
Bulb 260g	= 494g

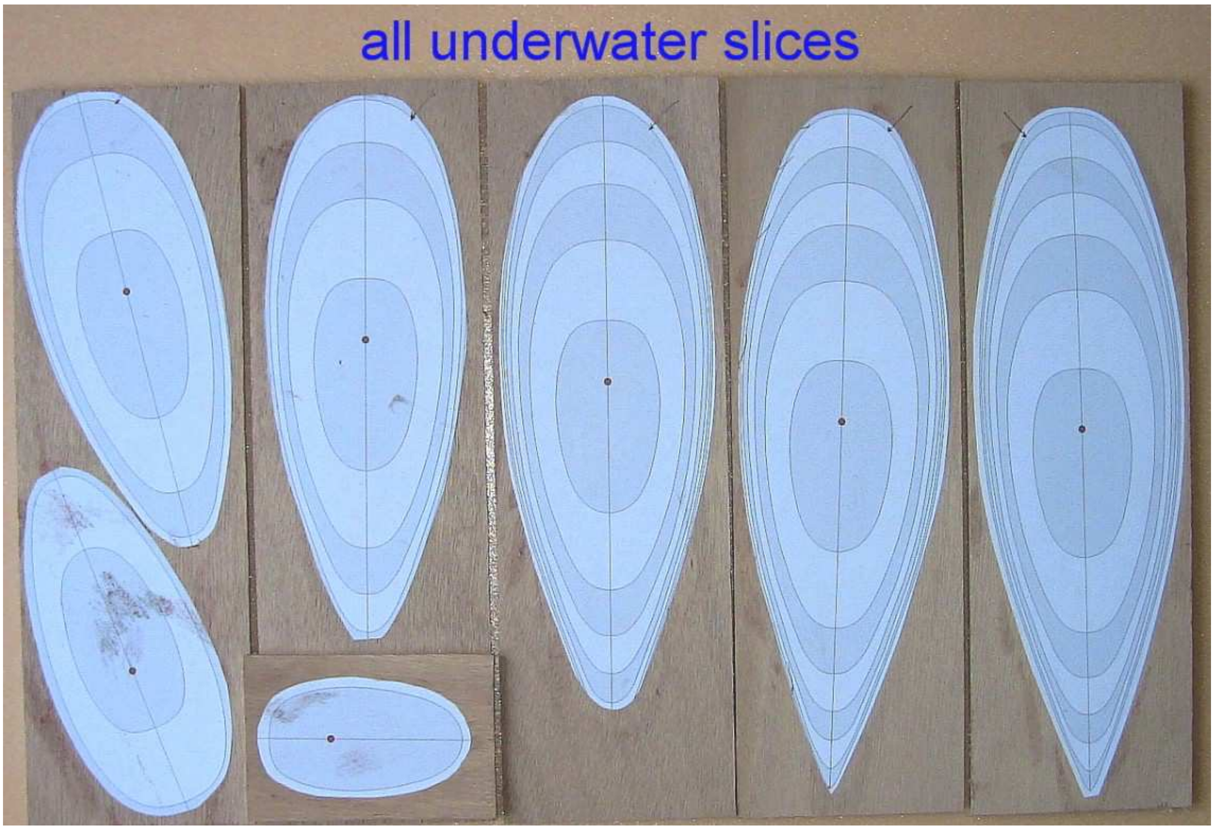


No Bumpkin used.
The rudder remain inside the Diagonal Box
Fin length limited to 200mm unless large sail area is used.

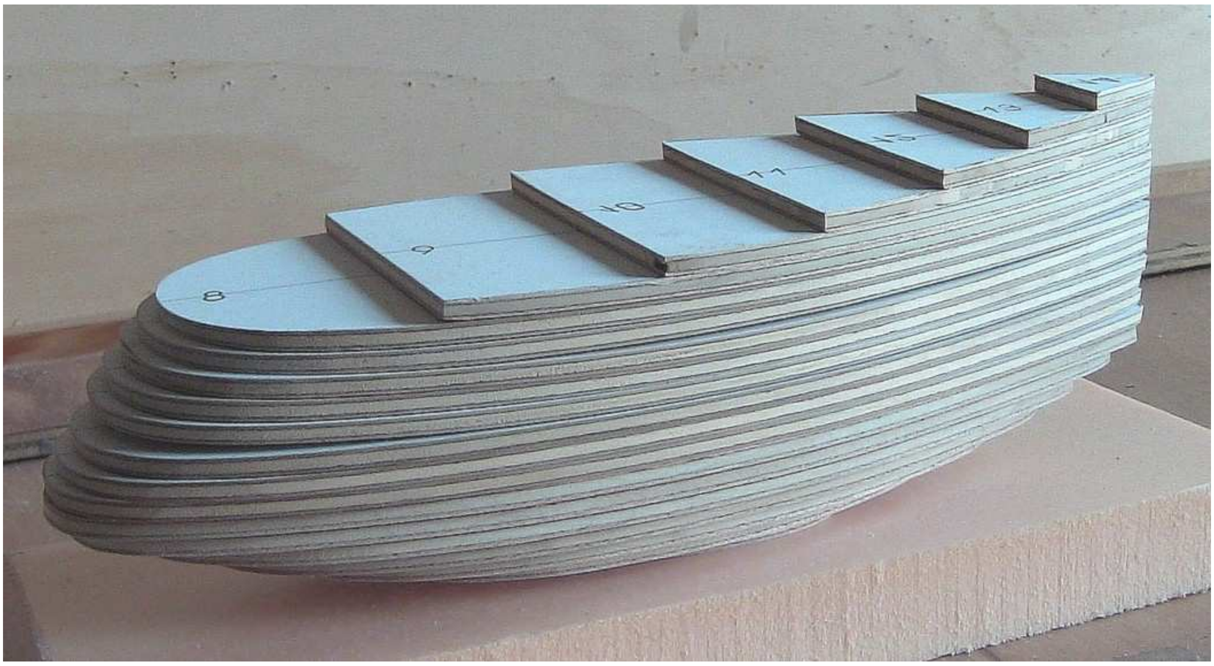
Provisory
Sail Plan





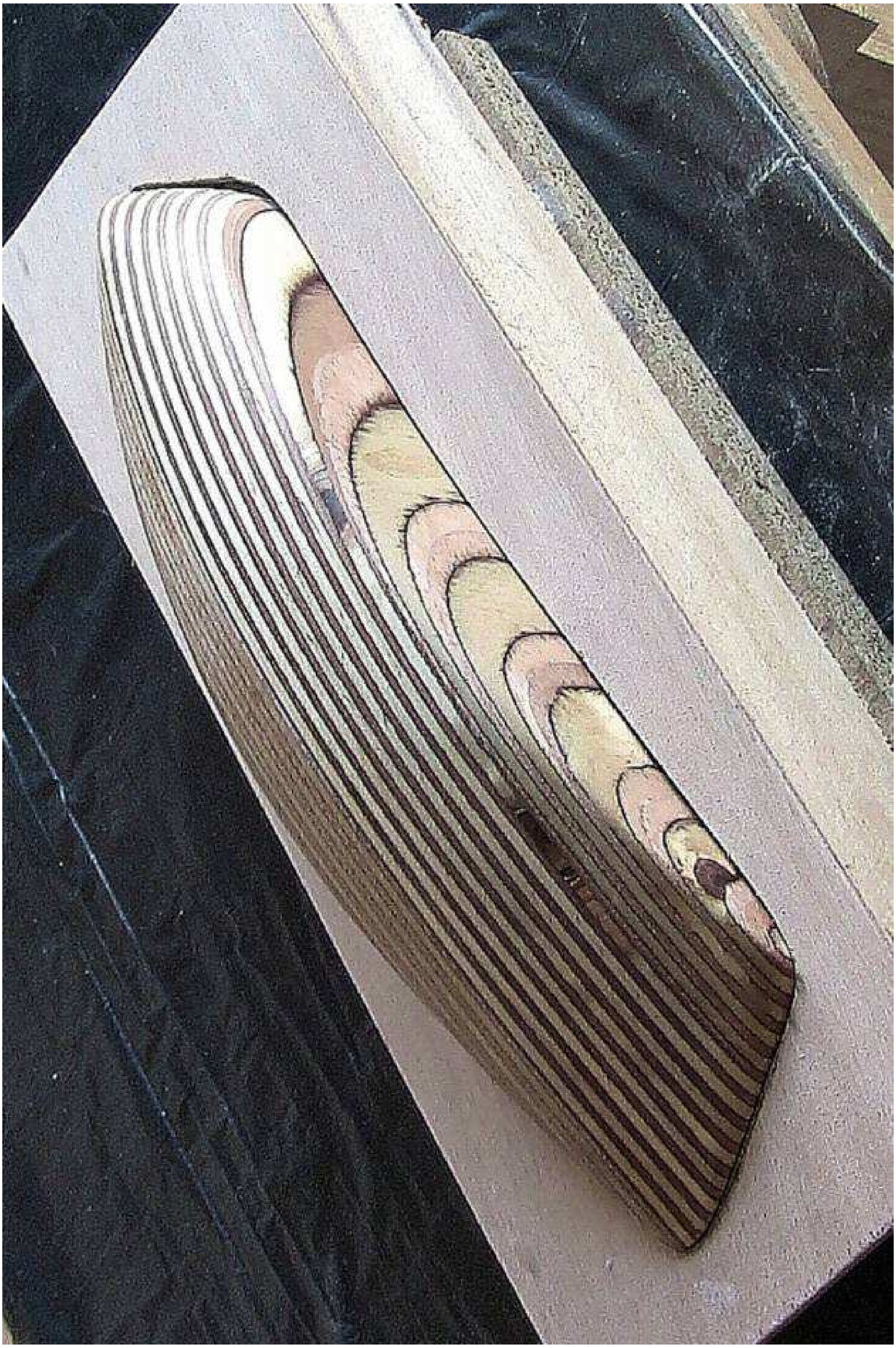


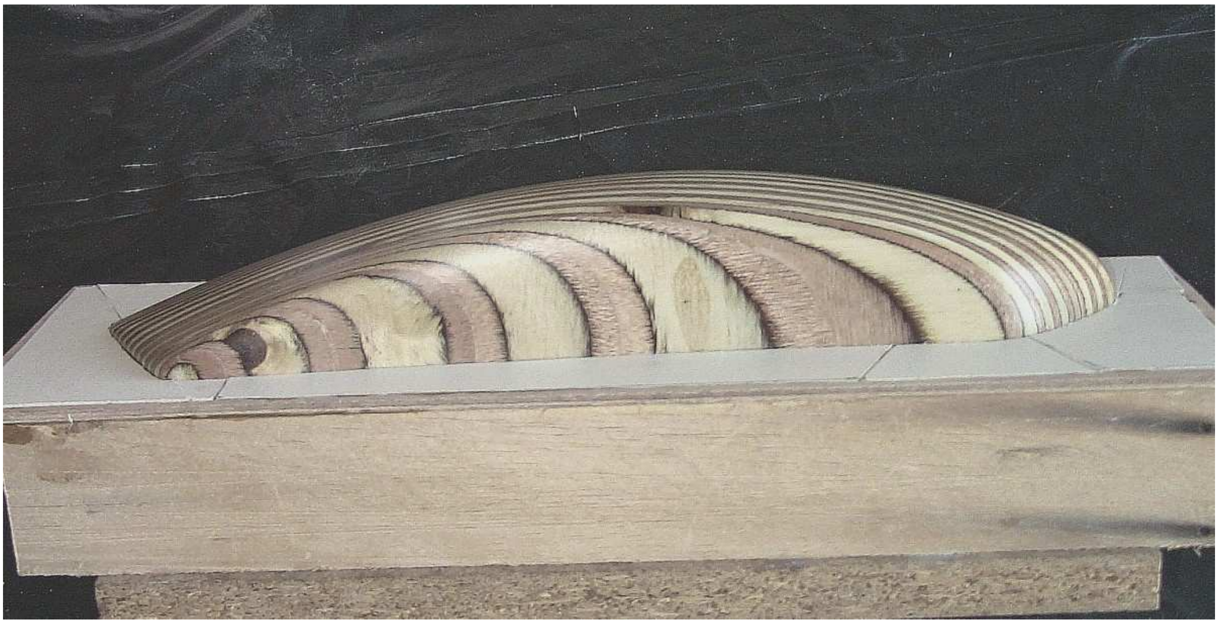
Cut out from 5mm thick Plywood



Slices assembled

Preparing the Molding Box



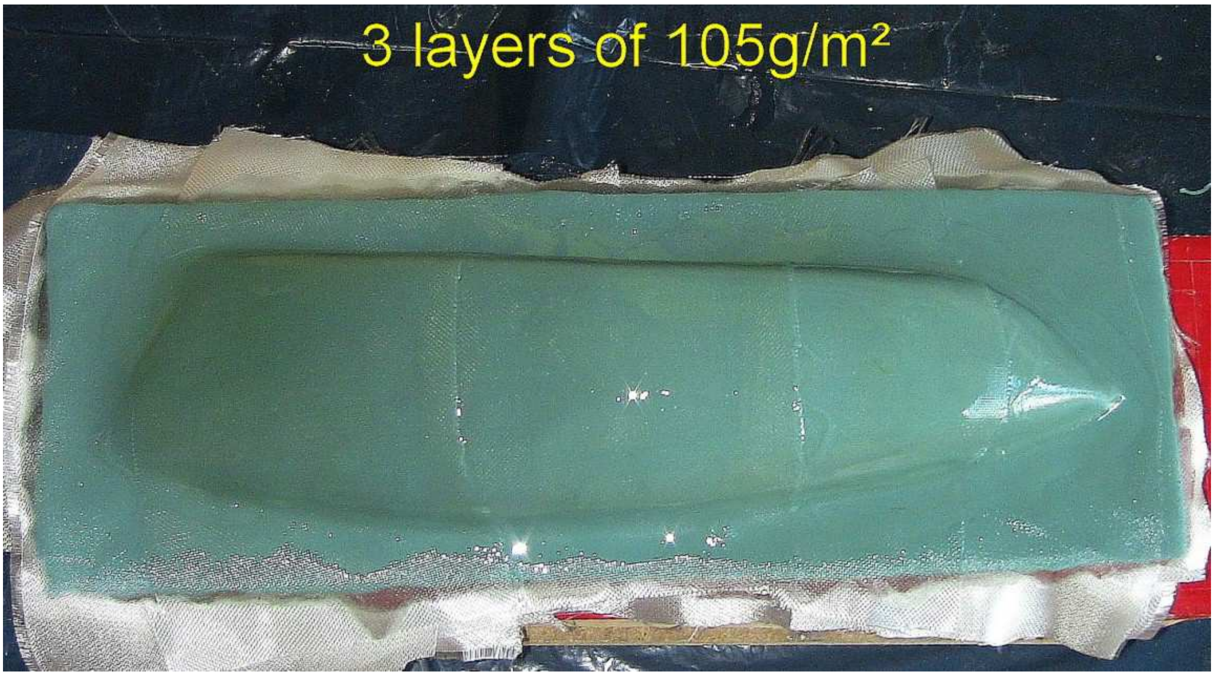


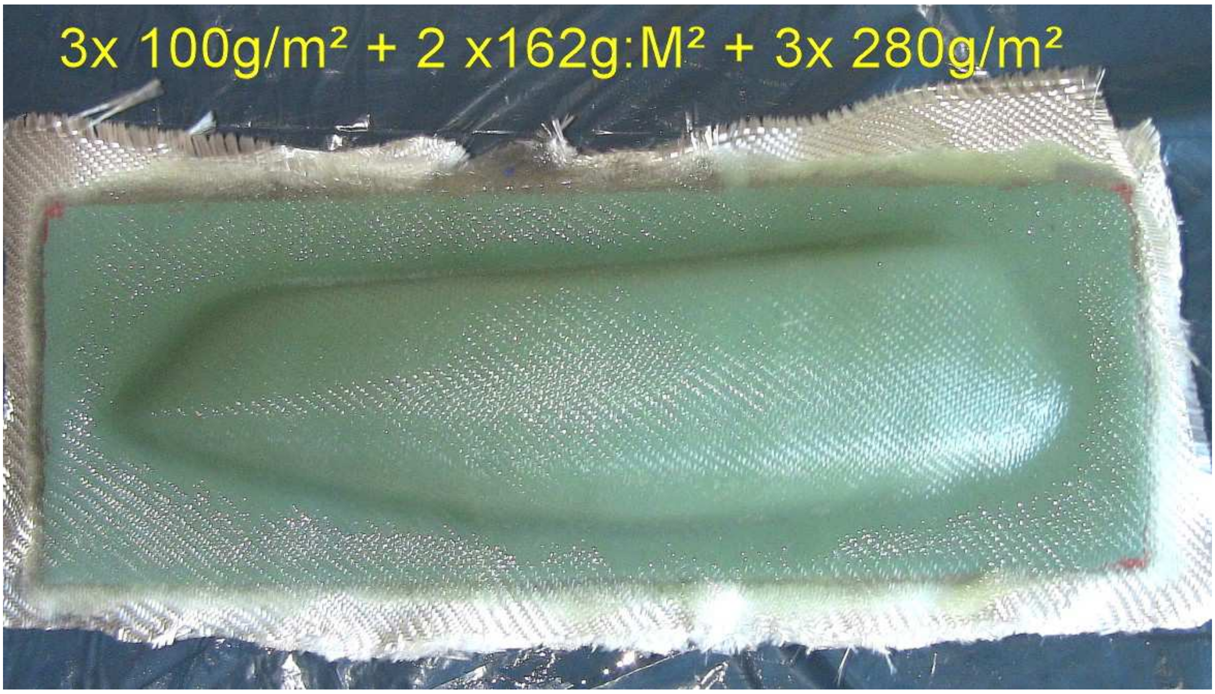
Piece of carton used to match the hull contour and than covered with 2cm wide red adhesive ribbon

Half mold lamination

Half mold made and out of the jig

Preparation of 2nd half mold starting with first Gelcoat layer and followed by a second layer.
Surfaces are waxed before Gelcoat application



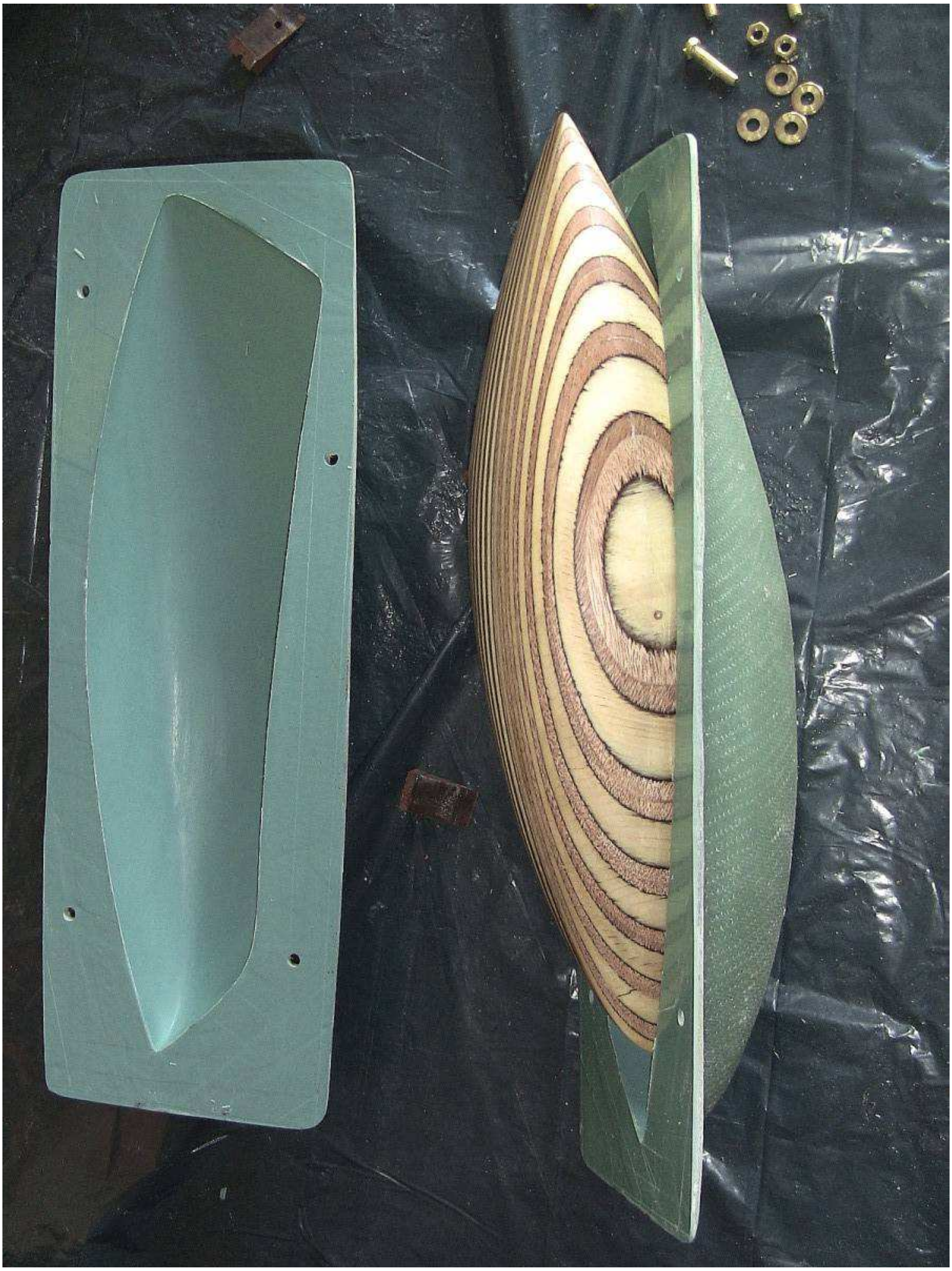


As for the first half the full mold lamination is completed.

The two halves extracted from the Jig, but still closed each other.

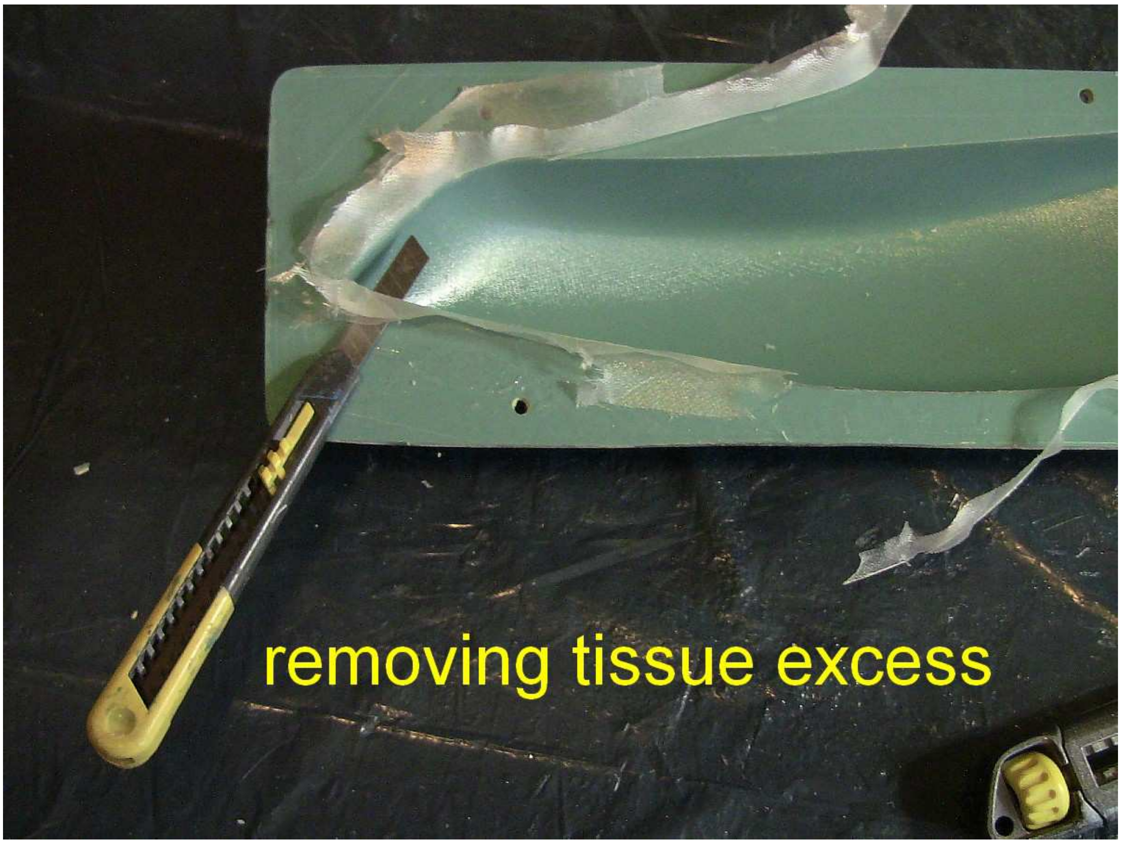
A way to separated the two halves

It can be noticed that the two half molds will be retained with bolts for future lamination processes..



Clean view of the dual mold

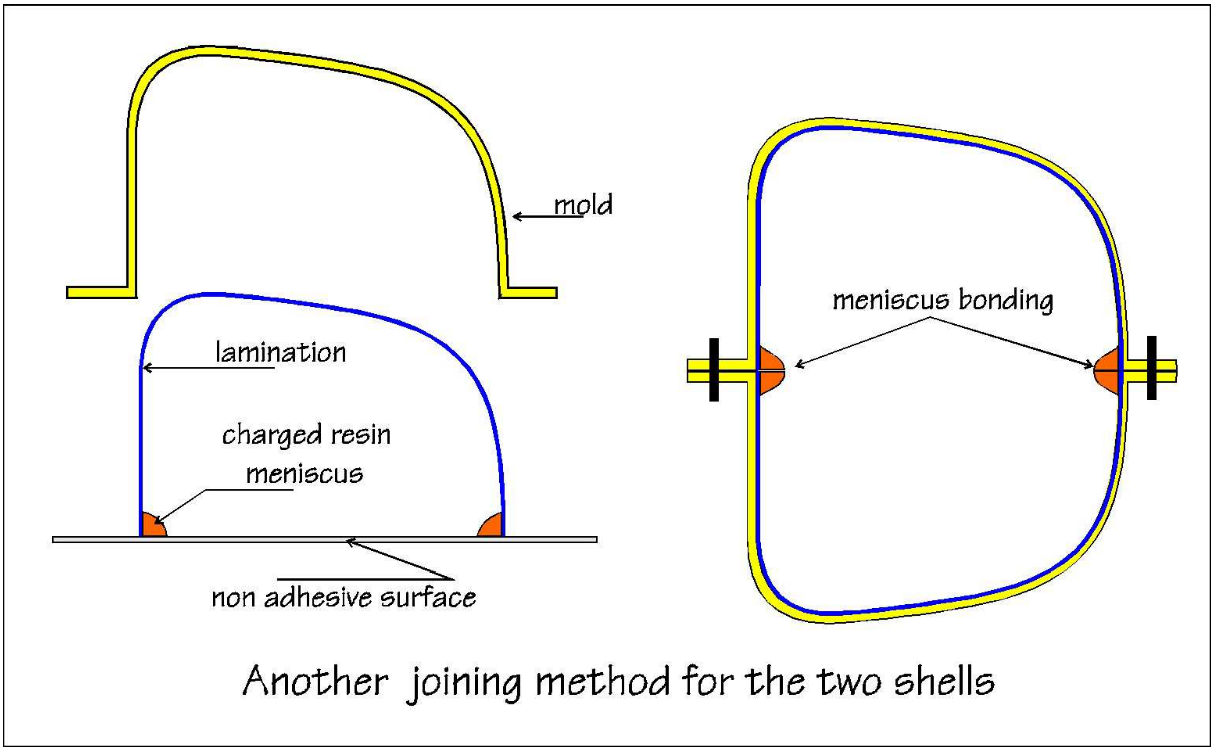
Both molds laminated with epoxy glass



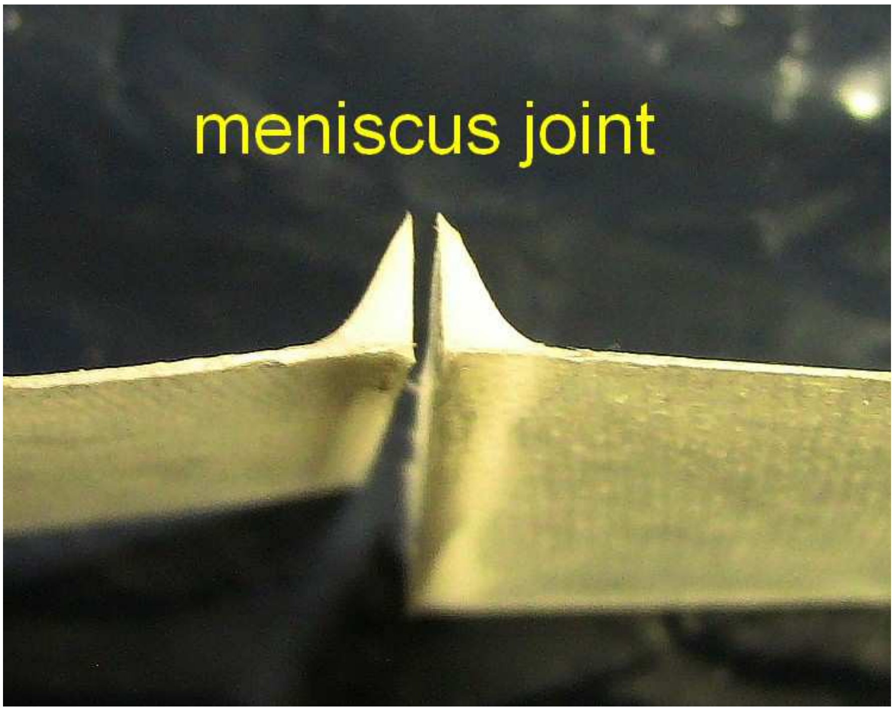
Removing excess of polymerized glass and extraction with laminated glass blade.

The two laminated hull halves

Less than 40g ..



the molds will be used to joint the two halves by means of a charged epoxy meniscus.
Sample test is made in order to measure the bonding strength

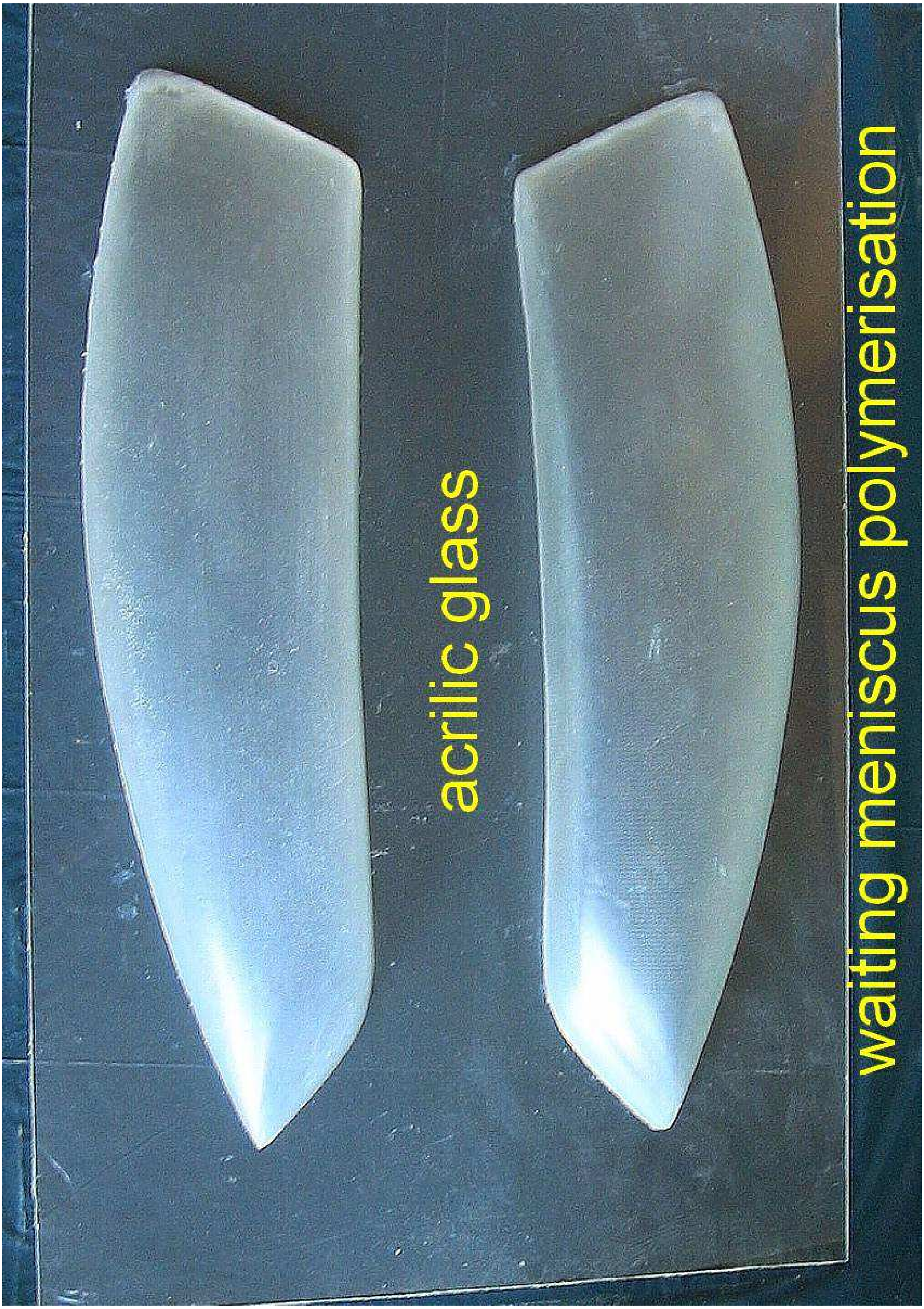


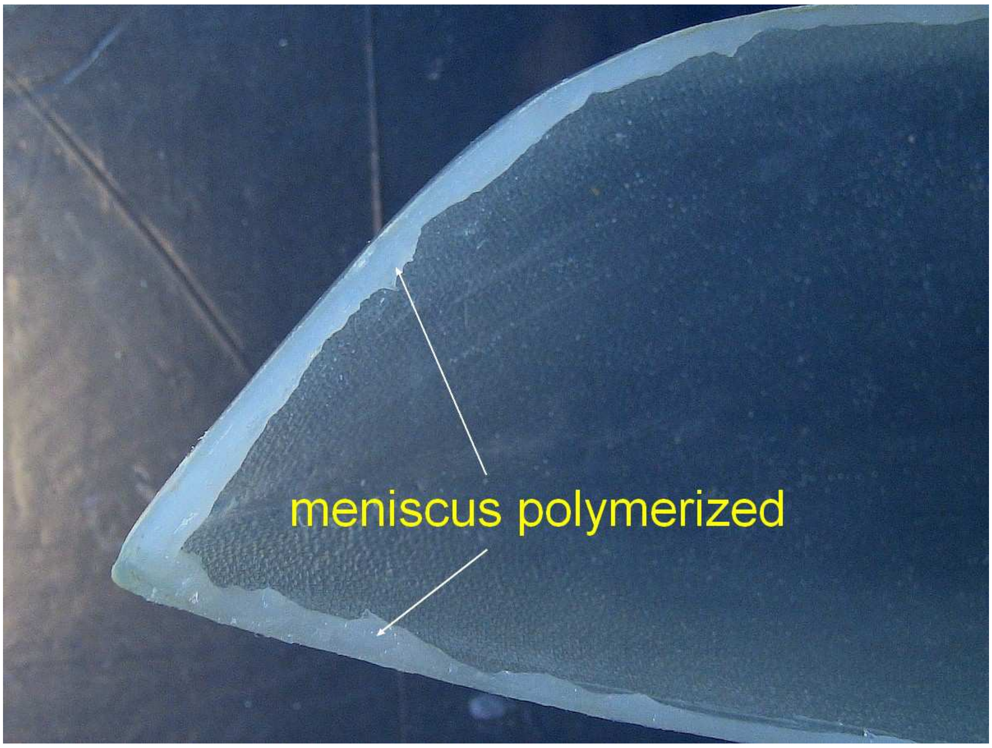

meniscus
pull test
6.02kg

Waxed acrylic glass plate used to depose the two halves for meniscus polymerization

Smearing along the edges the silica epoxy paste

The two halves are positioned on the acrylic plate





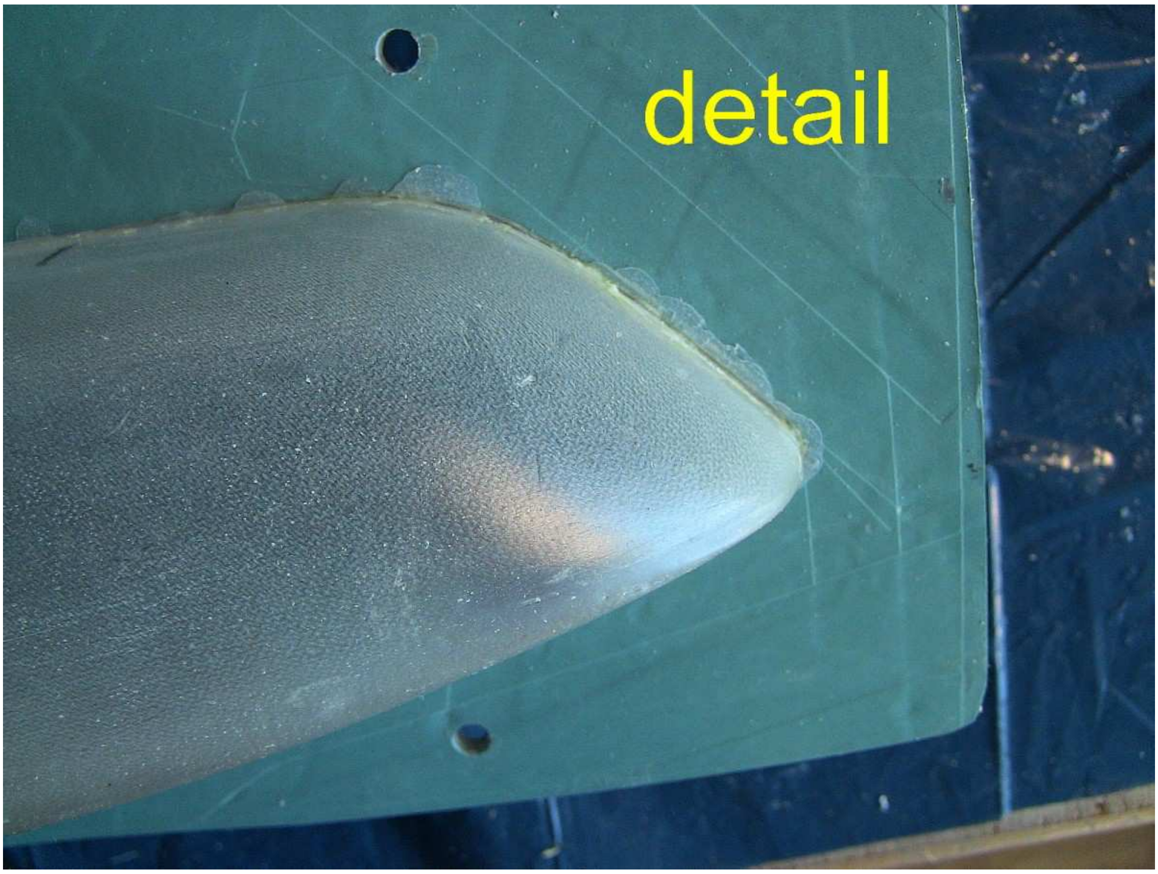
Close view of edges

Inside wood reinforcements patches lamination

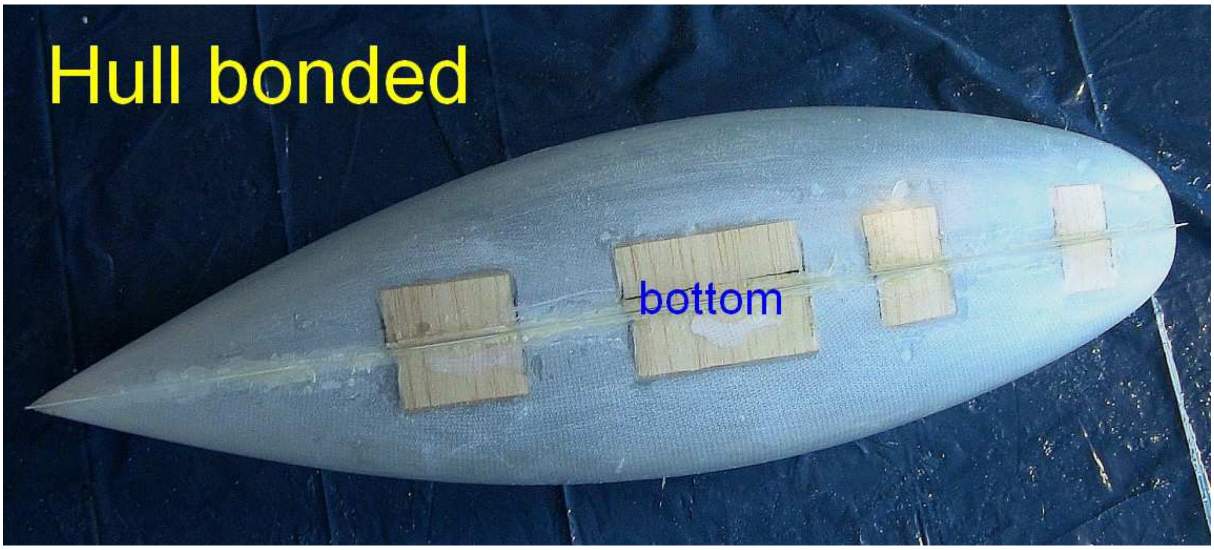
The two halves are ready for bonding

Mold closed after waxing waiting hull polymerization

Epoxy-glass Hull out of the dual mold



Residues of epoxy-silica paste to be removed all along the centerline.

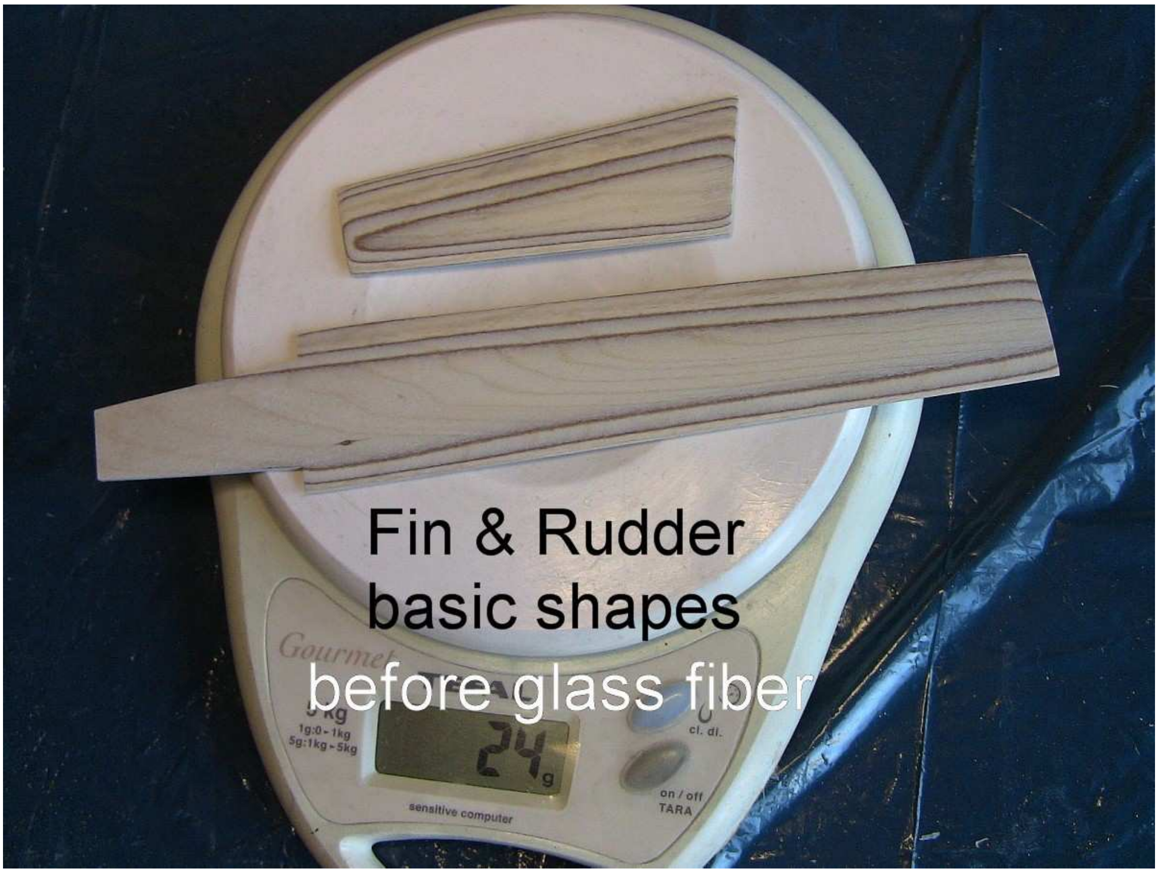


First view from bottom of the two bonded halves


Footy reverse bow hull

16g added for wood reinforcements and bonding paste.

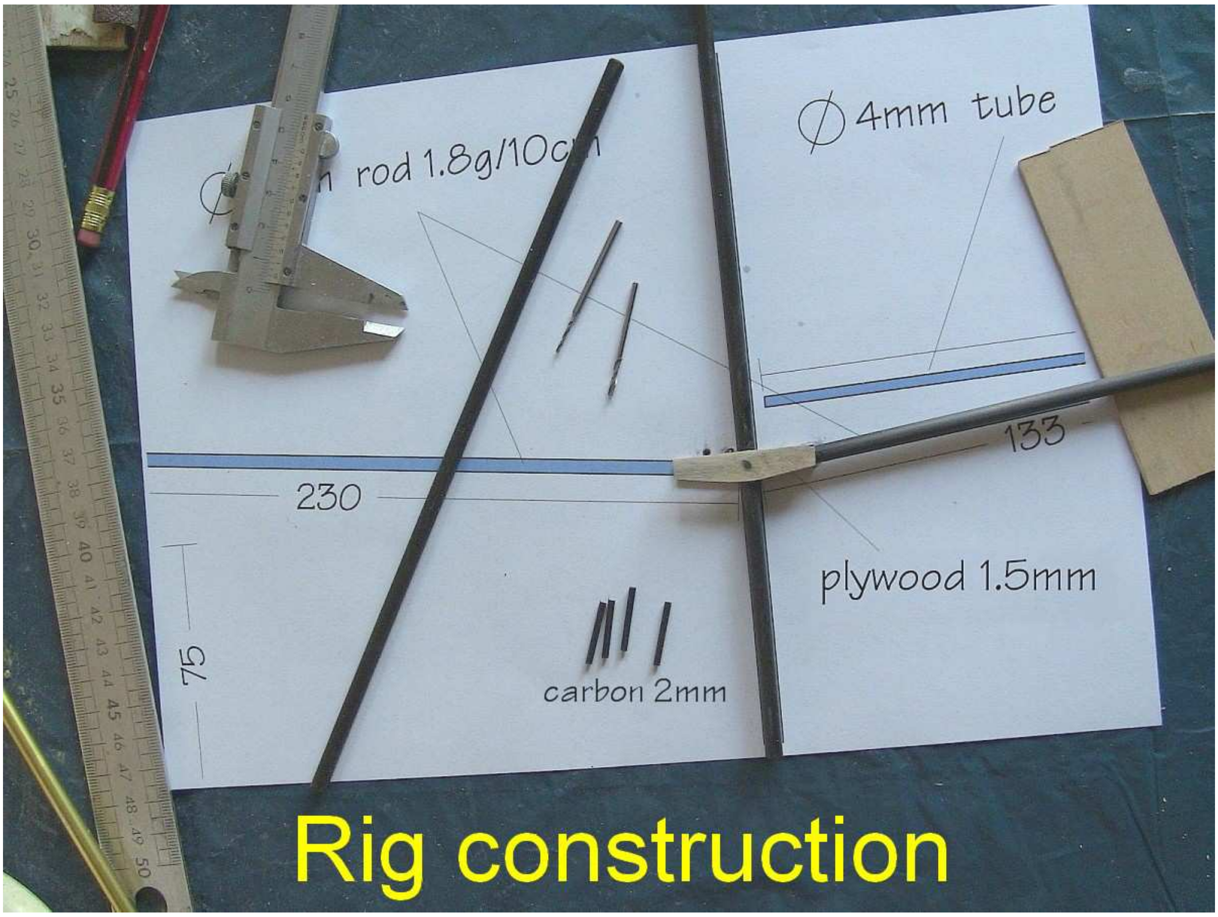

Fin /Rudder
1.5mm ply
sandwich


Fin & Rudder
basic shapes
before glass fiber
on / off
TARA
sensitive computer
24 g

Hull cleaned

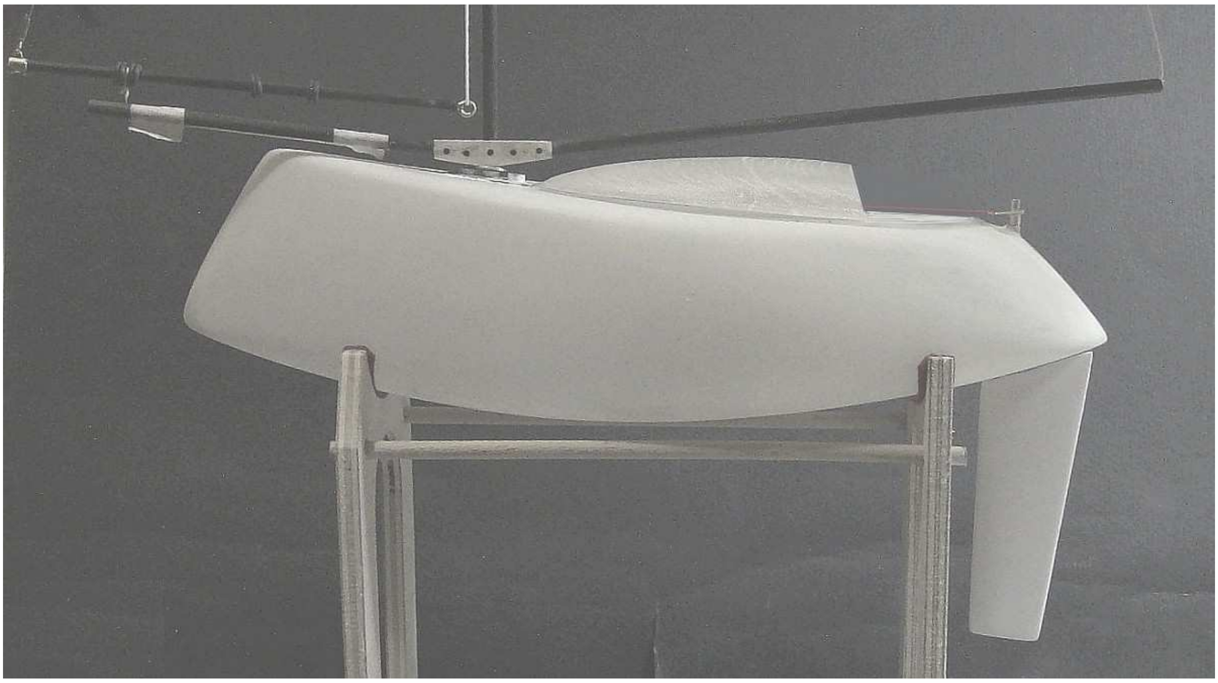
Deck cut-out for access

Hull filled with water checking for leaks.
Lead used inside to simulate the displacement weight of 525g



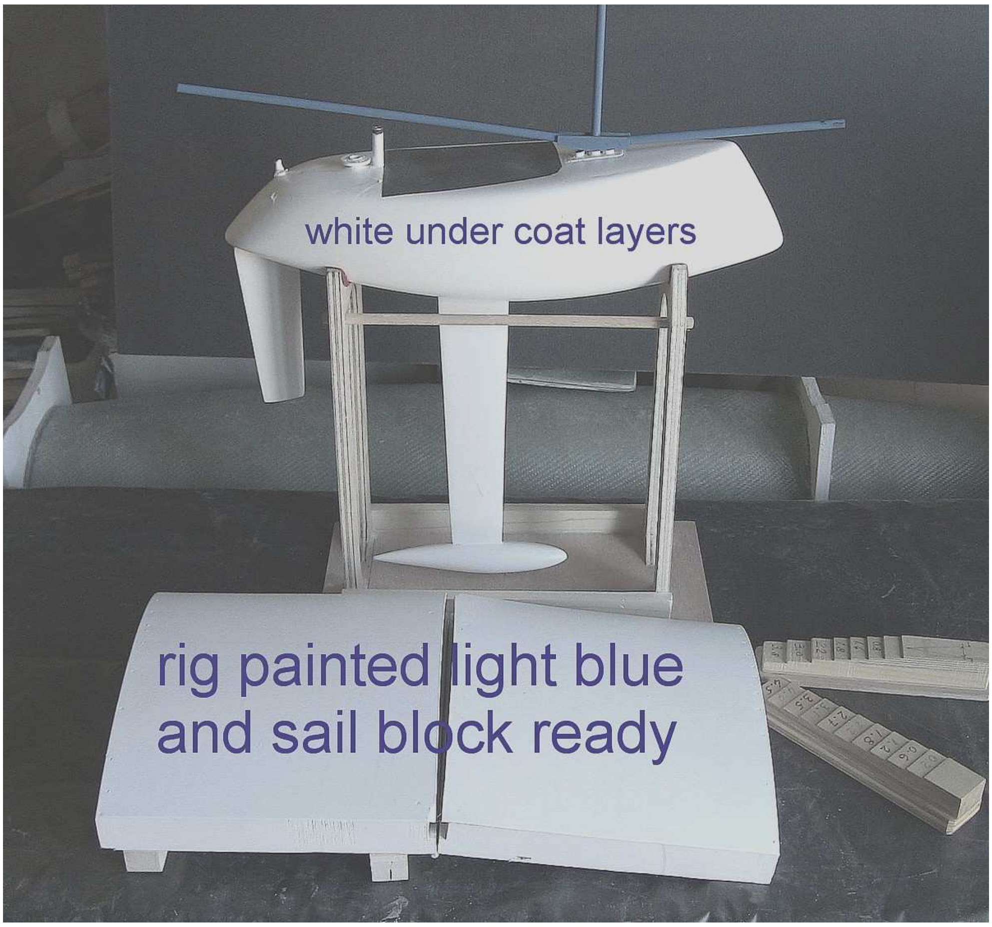
Drawing the Rig.

Canopy optional study



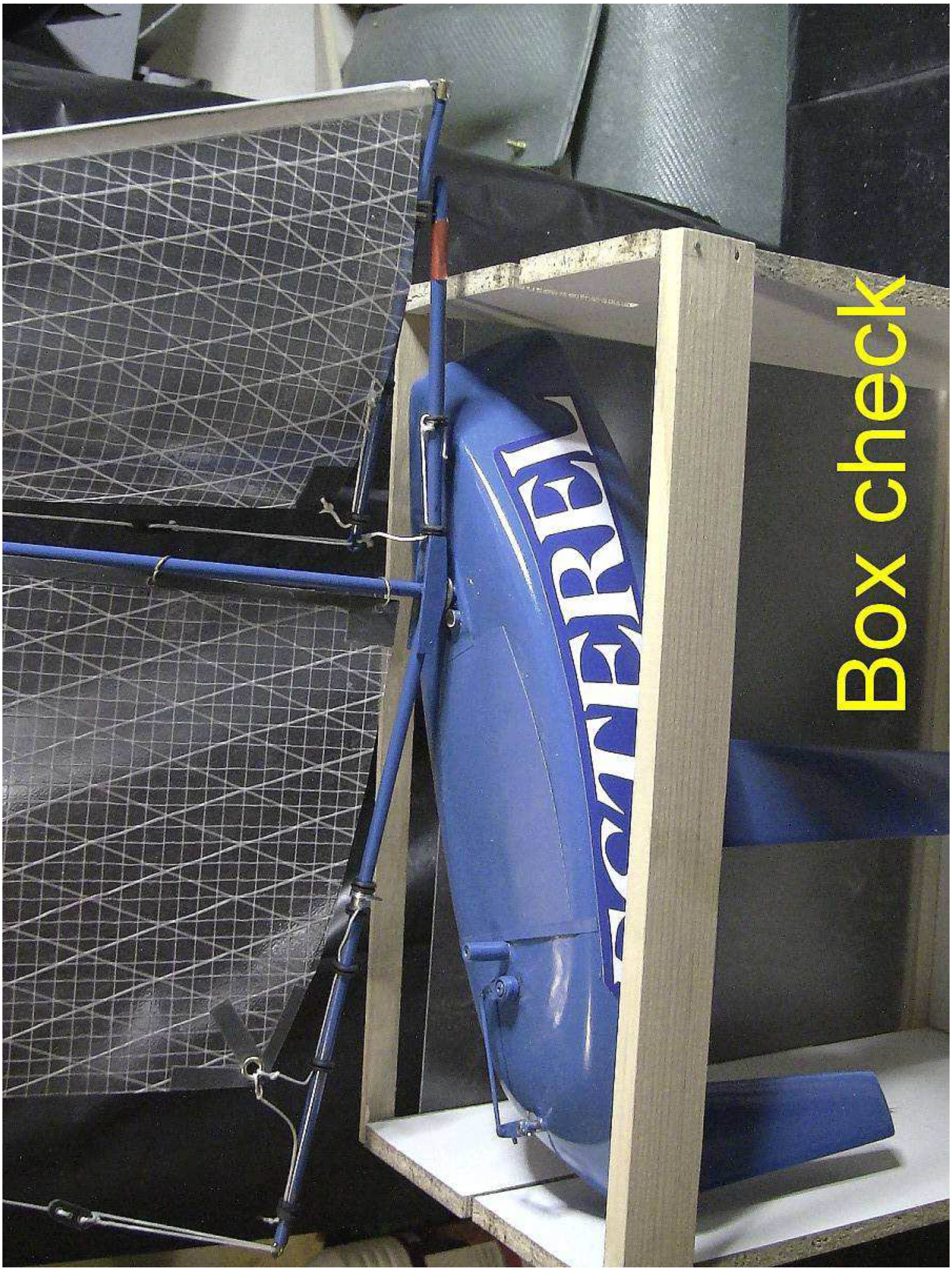
side view and rudder mount detail

Rig on wooden model



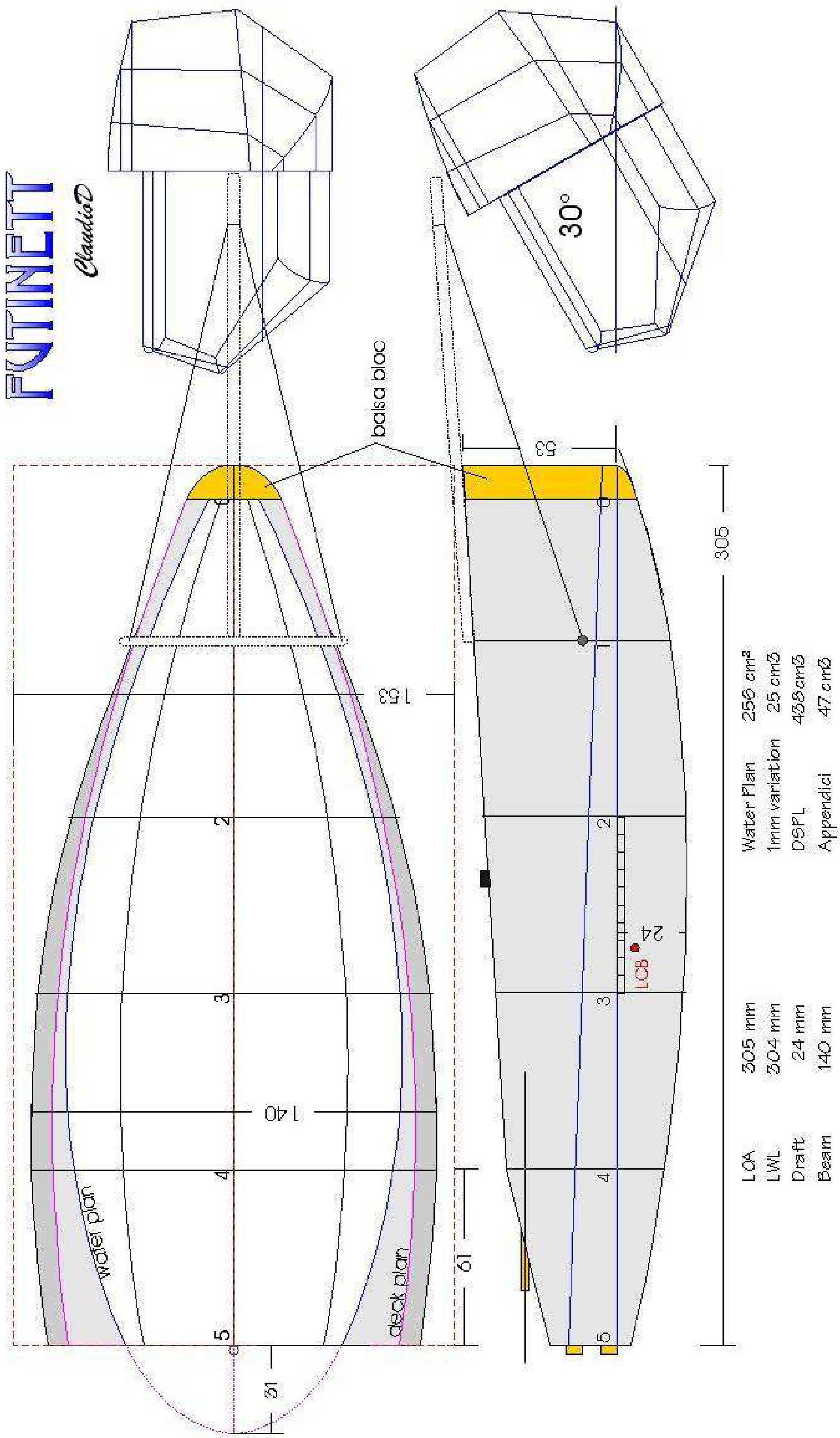
First sail made with new sail block

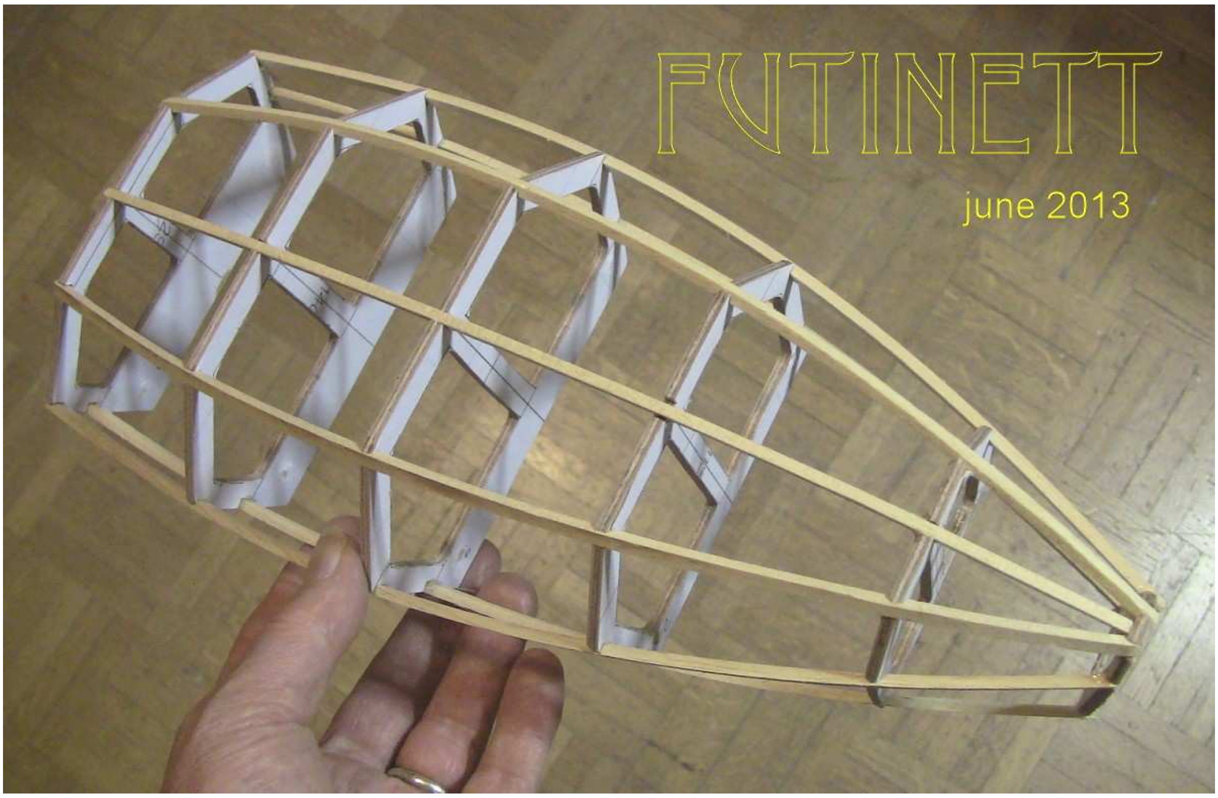
Footy Esterel inside the Box

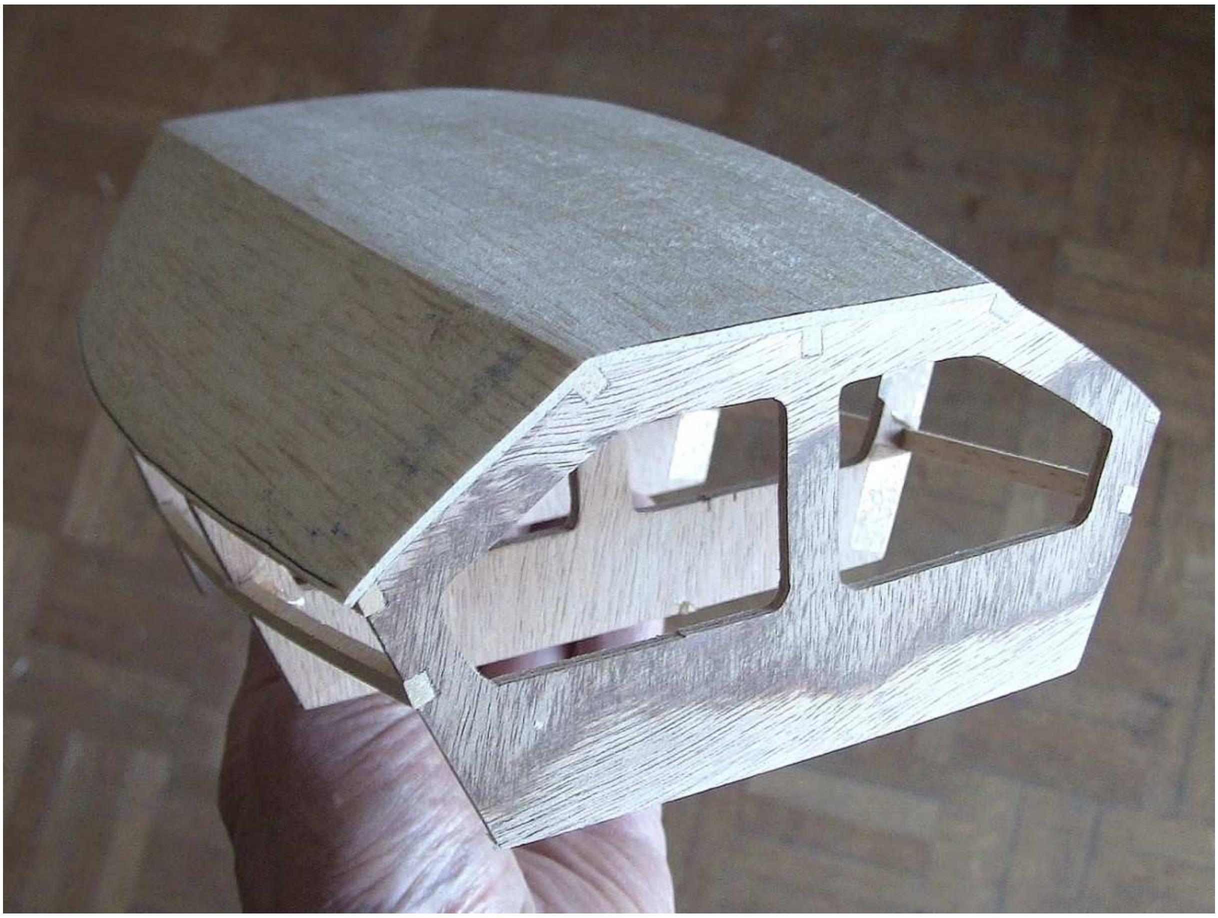


Launch date unknown, but already sailing in East European Countries

The design adventure continued with the development of the Futynett.

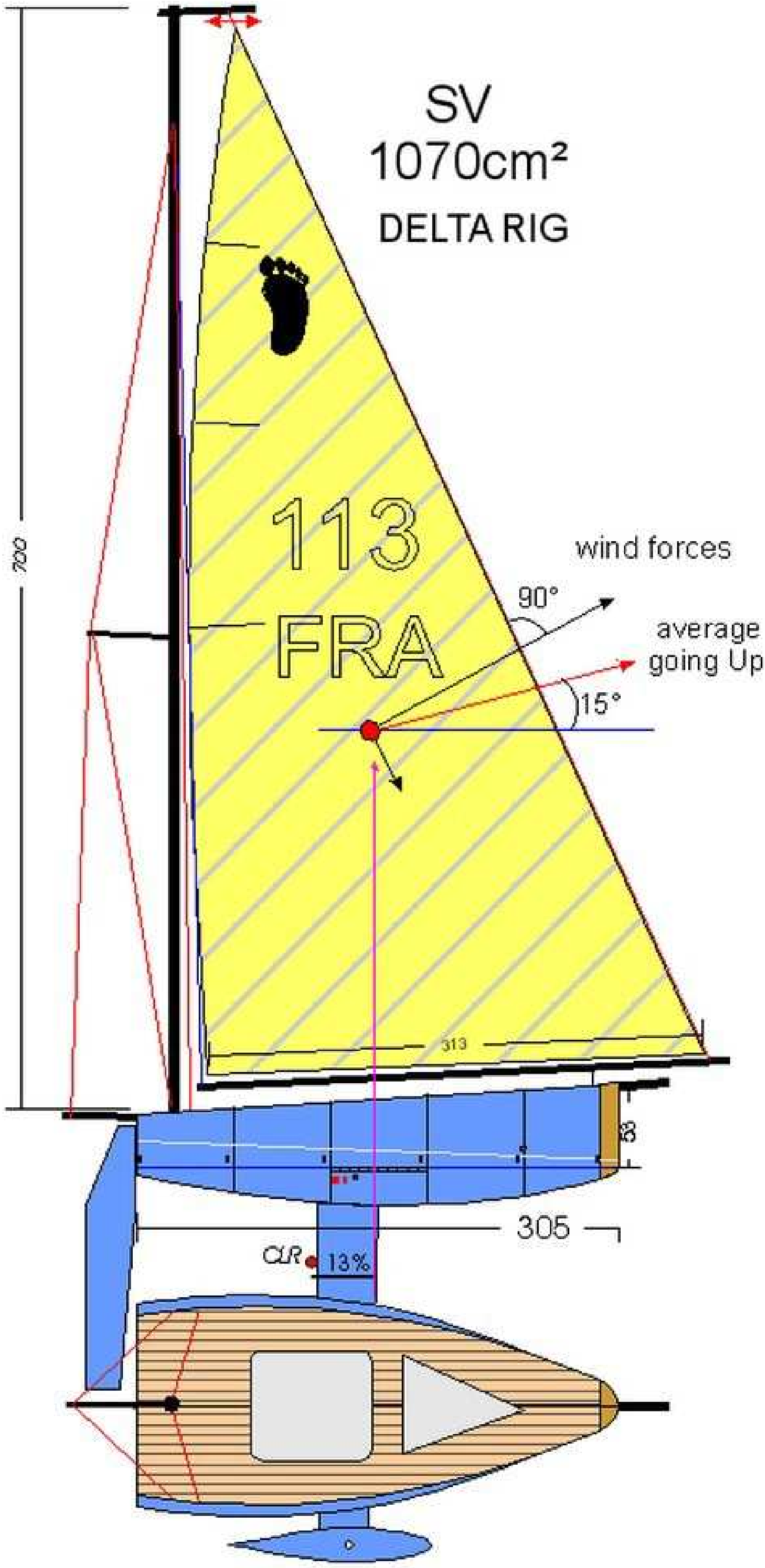



FUTINETT
june 2013

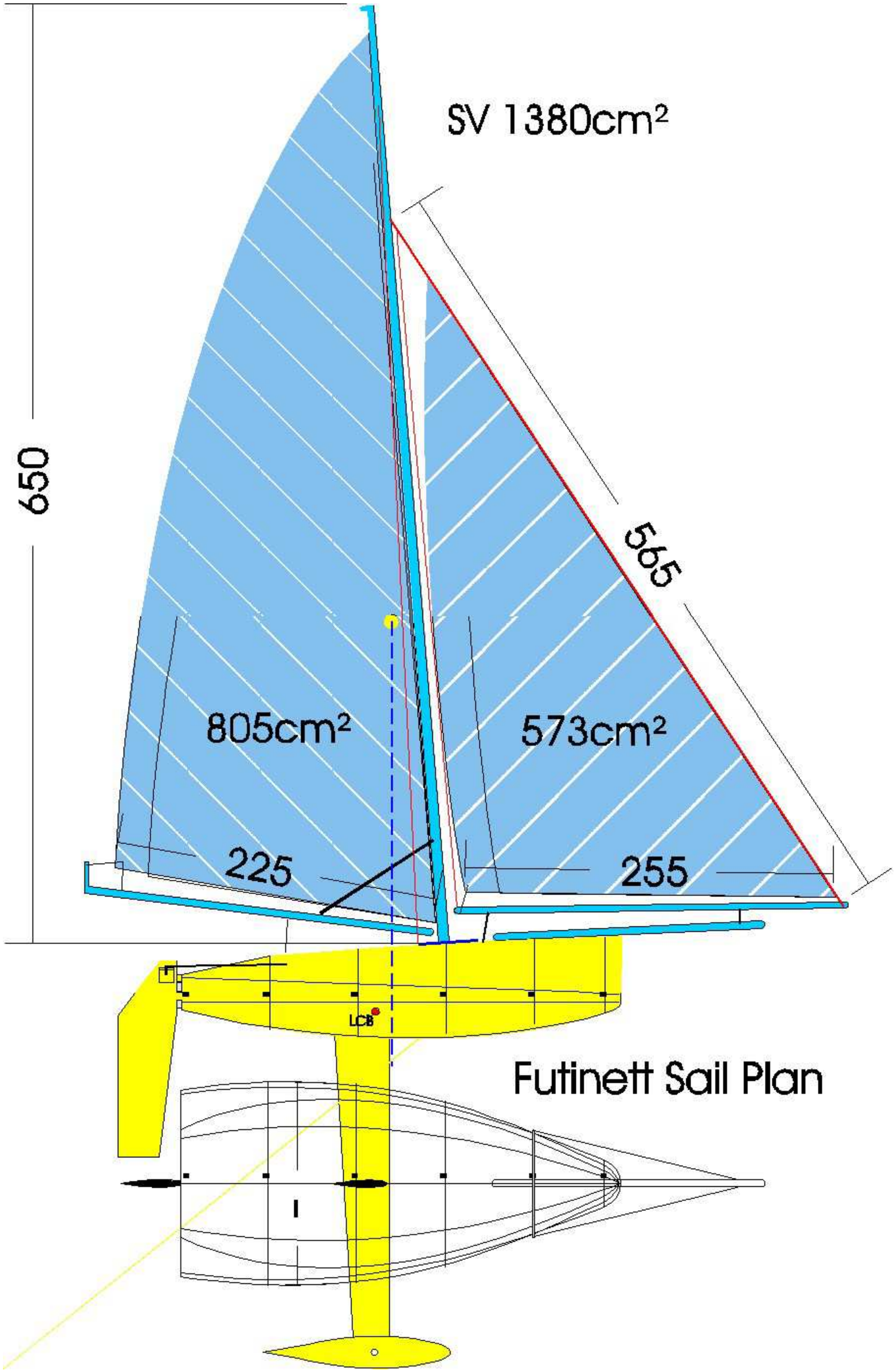



Futinett

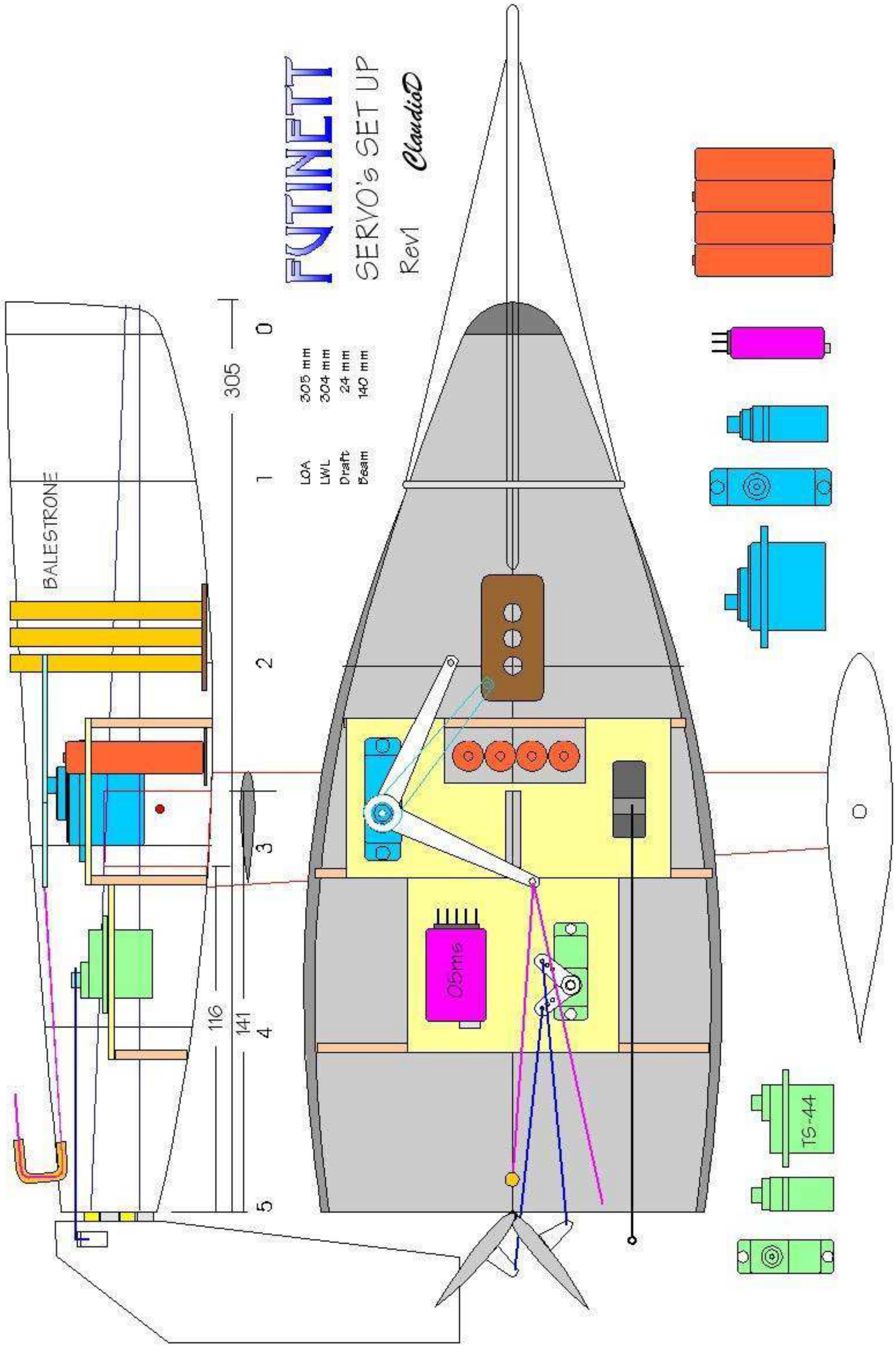

Gourmet
TEFAL
5 kg
32 g
Futinett


SV
1070cm²
DELTA RIG
113
FRA
wind forces
90°
average
going Up
15°
700
313
53
305
CLR
13%

In view of a Mold construction or direct Hull molding


SV 1380cm²
650
565
805cm²
573cm²
225
255
LCB
Futinett Sail Plan

Futynett layout



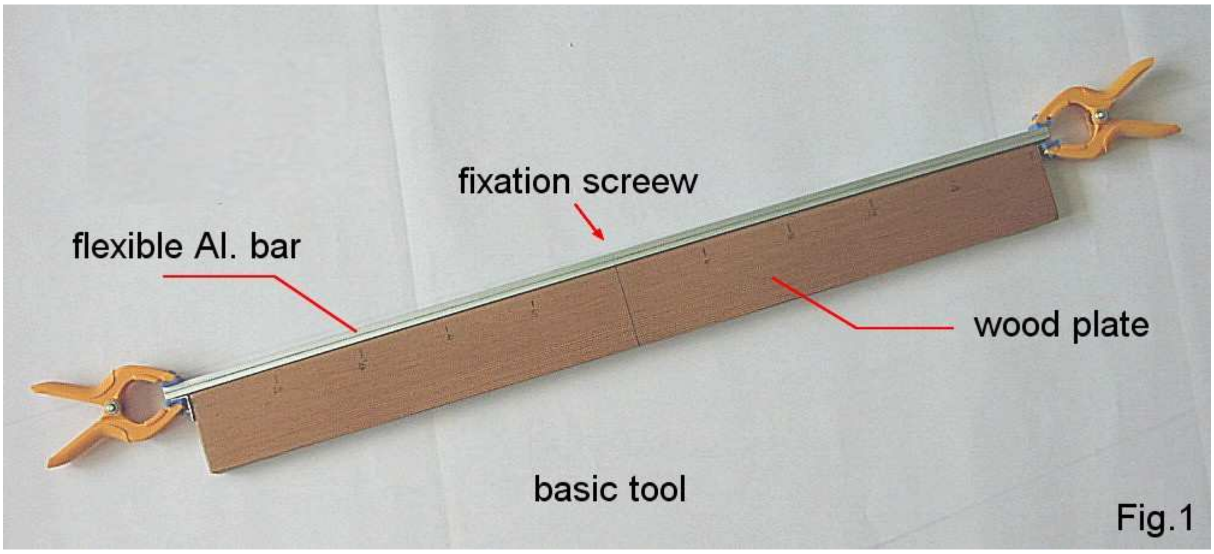
The first half mold

The Footy Story is ending here !

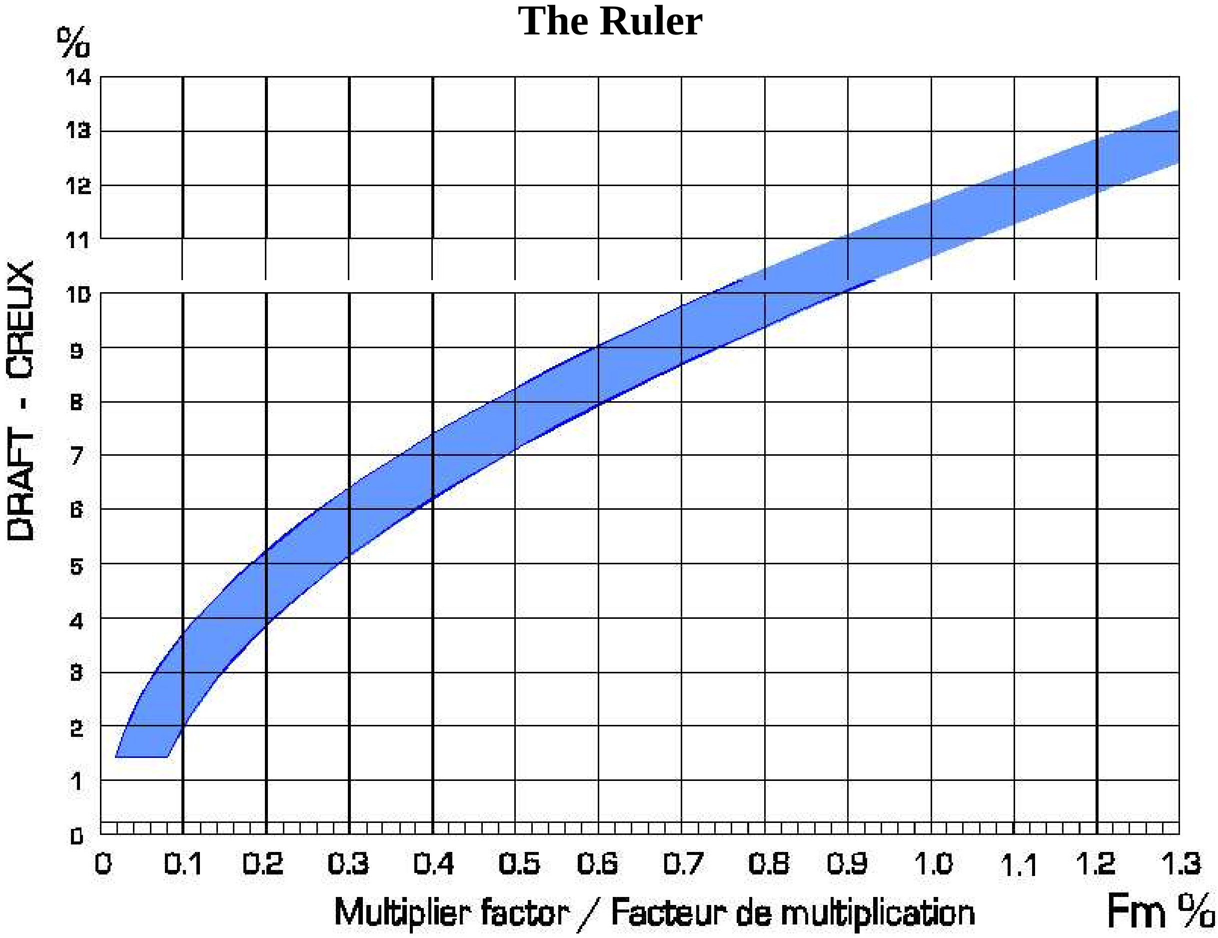
Claudio Gadget

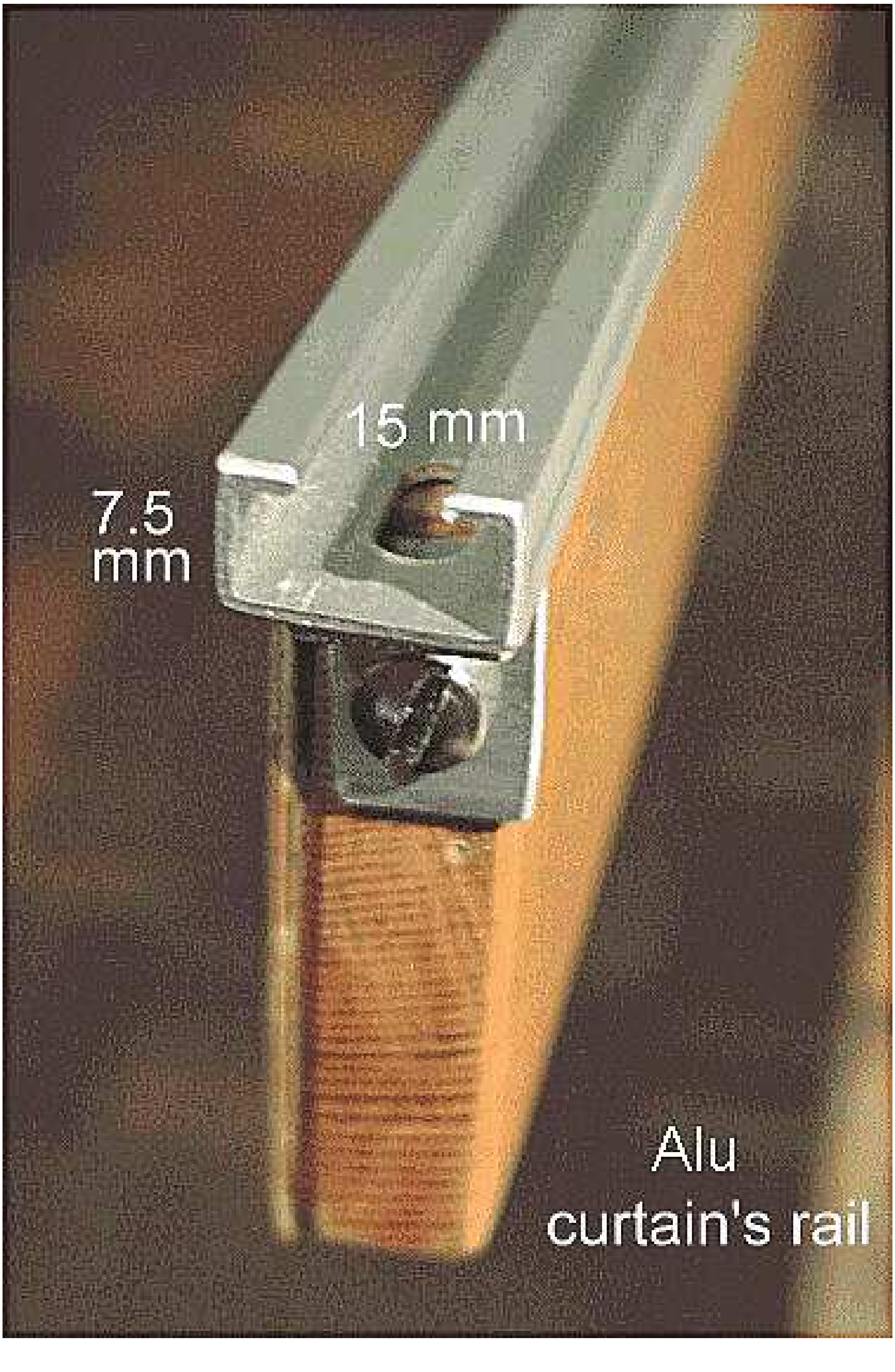
I do not wish to exchange points of view about Sails theories, but simply presenting a simple tool used ages ago to make sails.
This tool was called "Claudio Gadget" in the States, but it is not my design, but rather a discovery made with Sail Models Club AMON sitting close to the city of Milan in Italy.
I presented this "tool" for the first time with the "minicoque" a French forum in 2004.
Was later collected by RCSailing.net Forum and another Modeler decided to write a paper on the subject, he is Eric Rosenbaum, to him I do address my Thanks.
A series of pictures taken several years ago at the time of first presentation:

The Basic Tool



The Ruler




15 mm
7.5
mm
Alu
curtain's rail

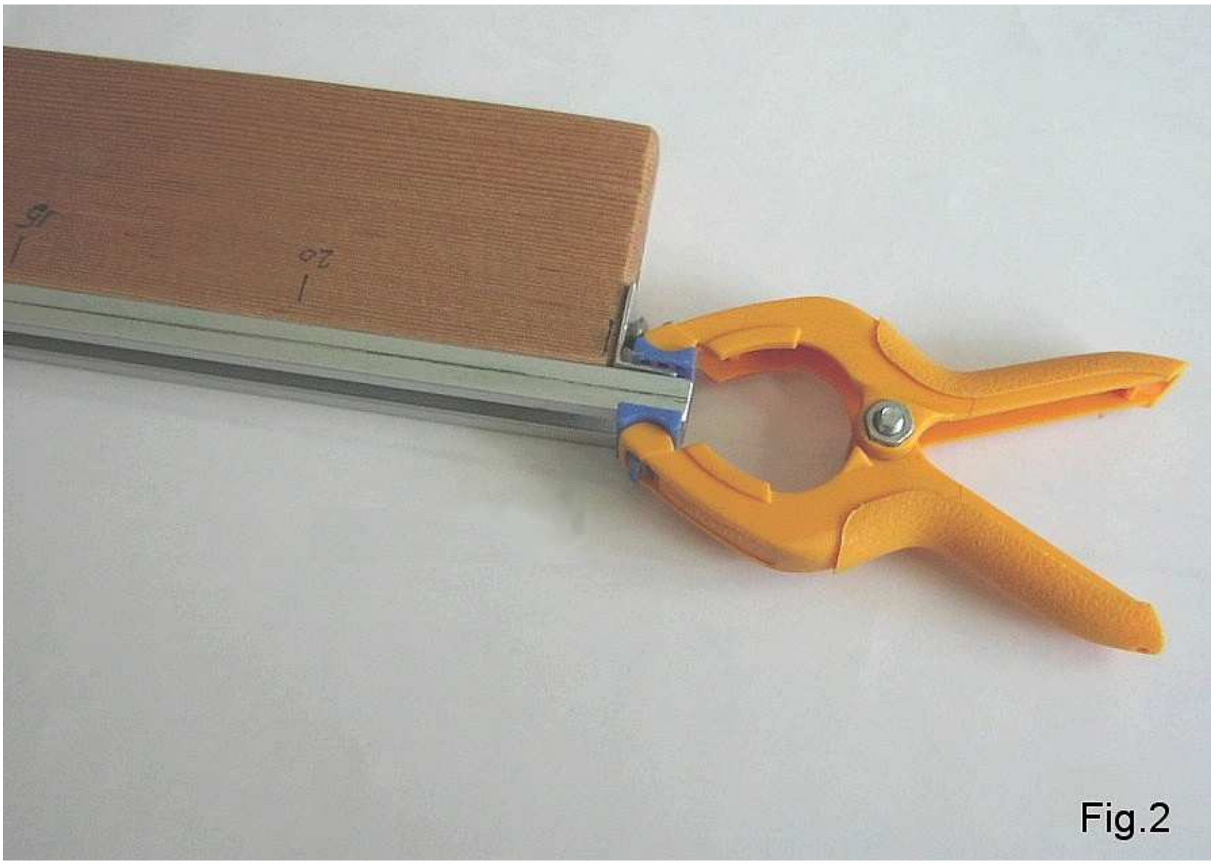
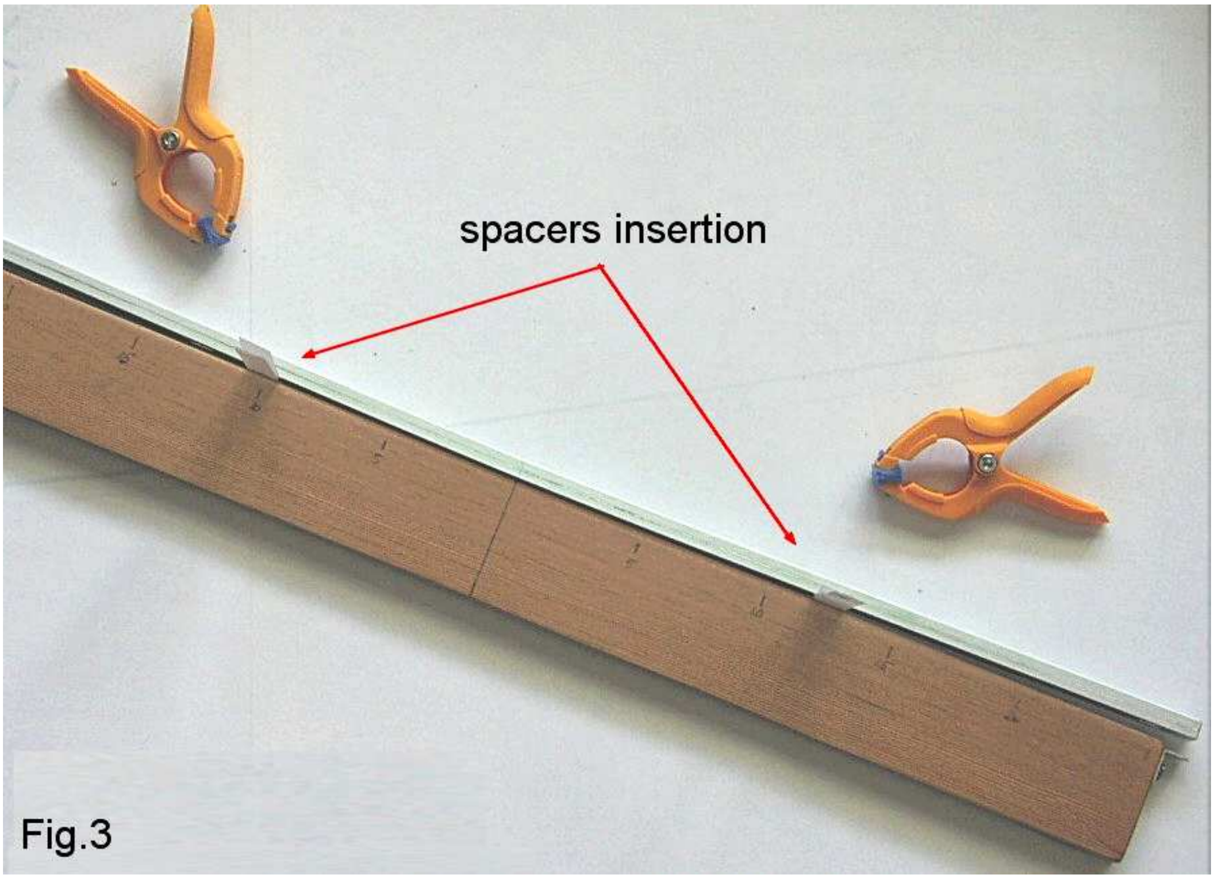


Fig.2


spacers insertion
Fig.3

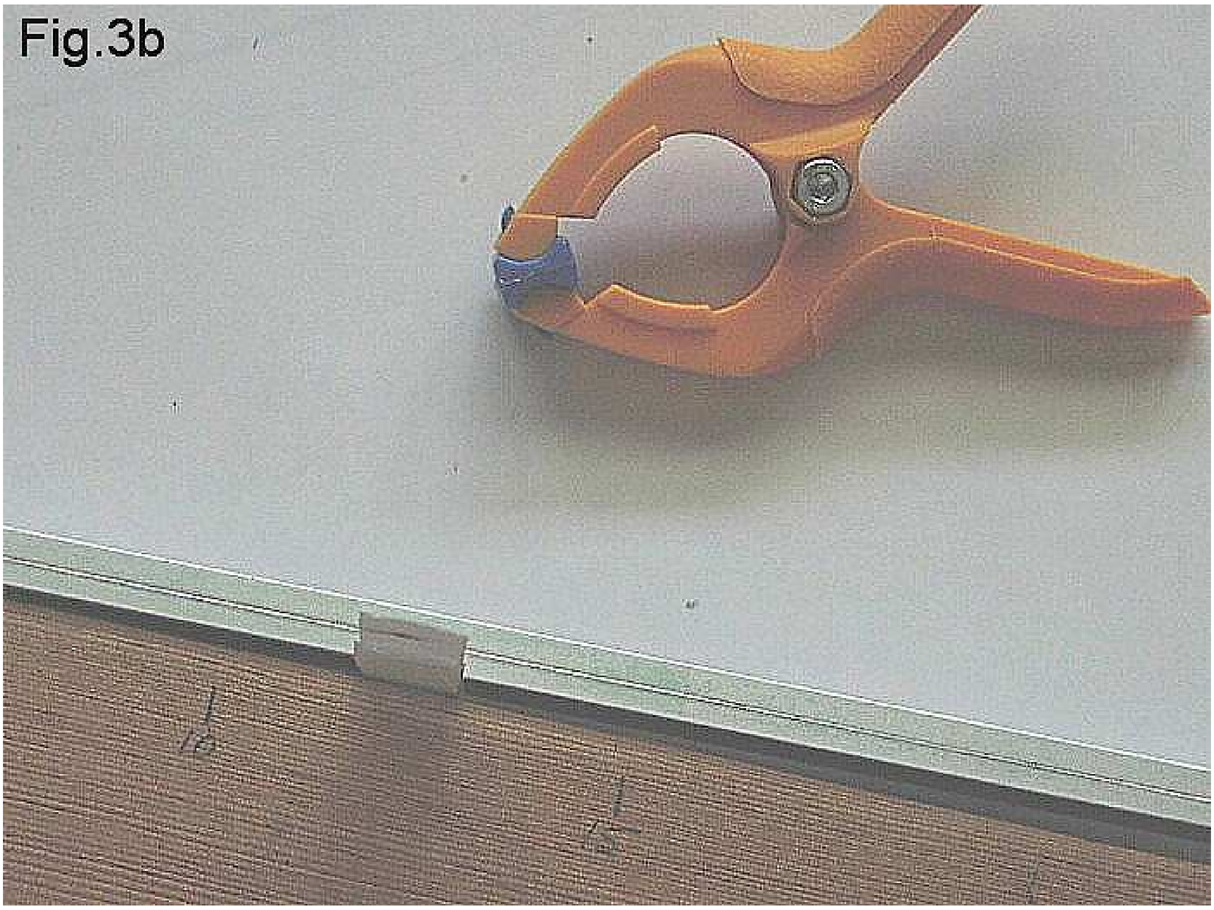


Fig.3b

fixing 1st dual face adhesive Fig.4

adhesive protection removal Fig.5

bonding 1st panel Fig.6

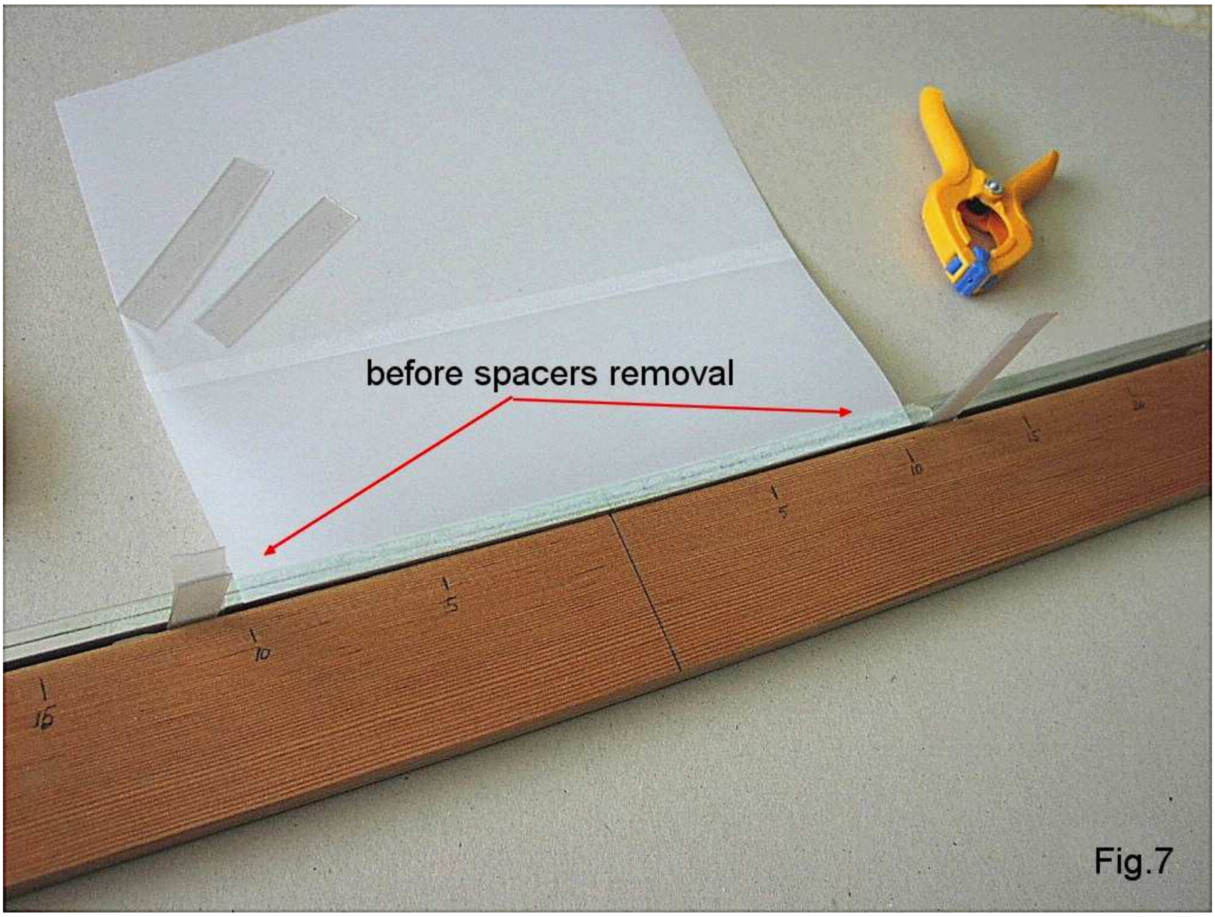


Fig.7

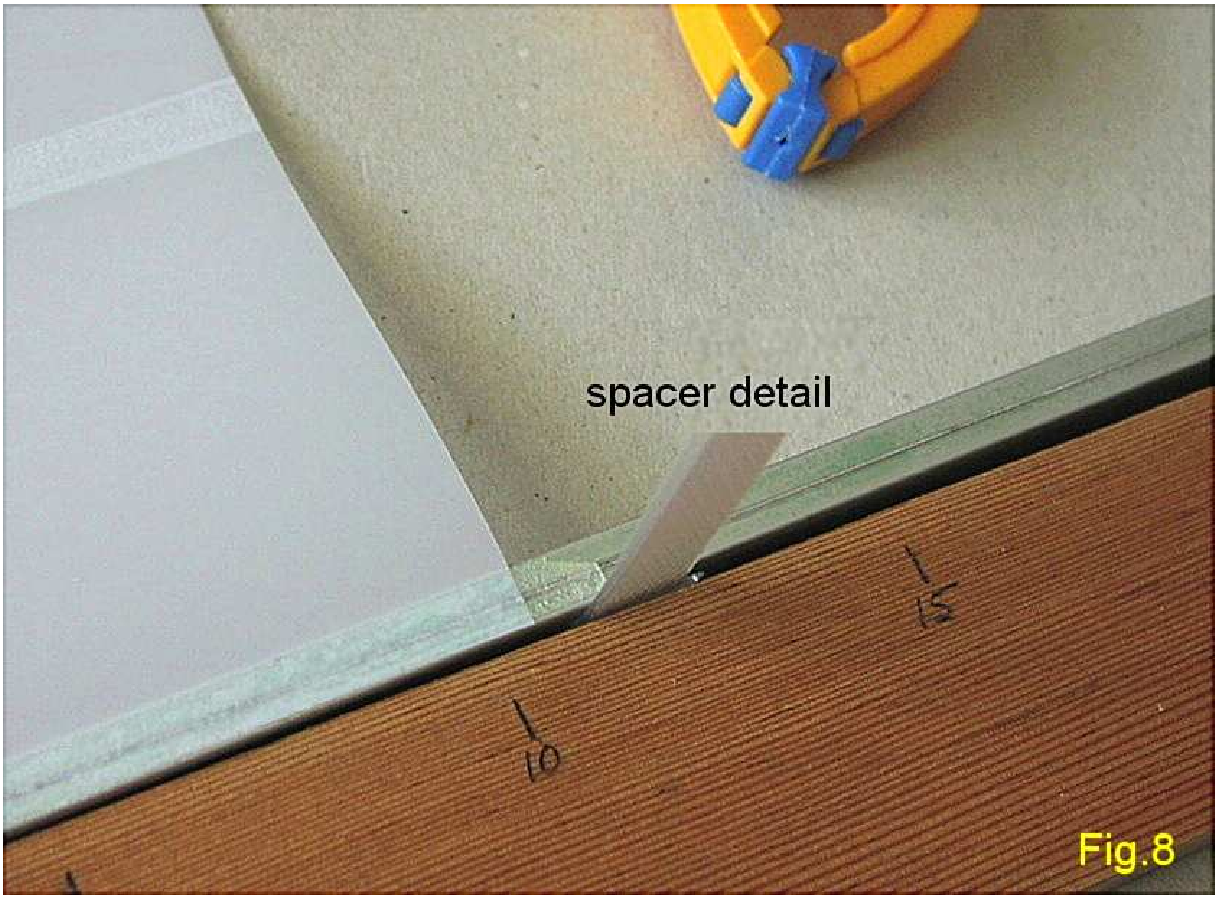
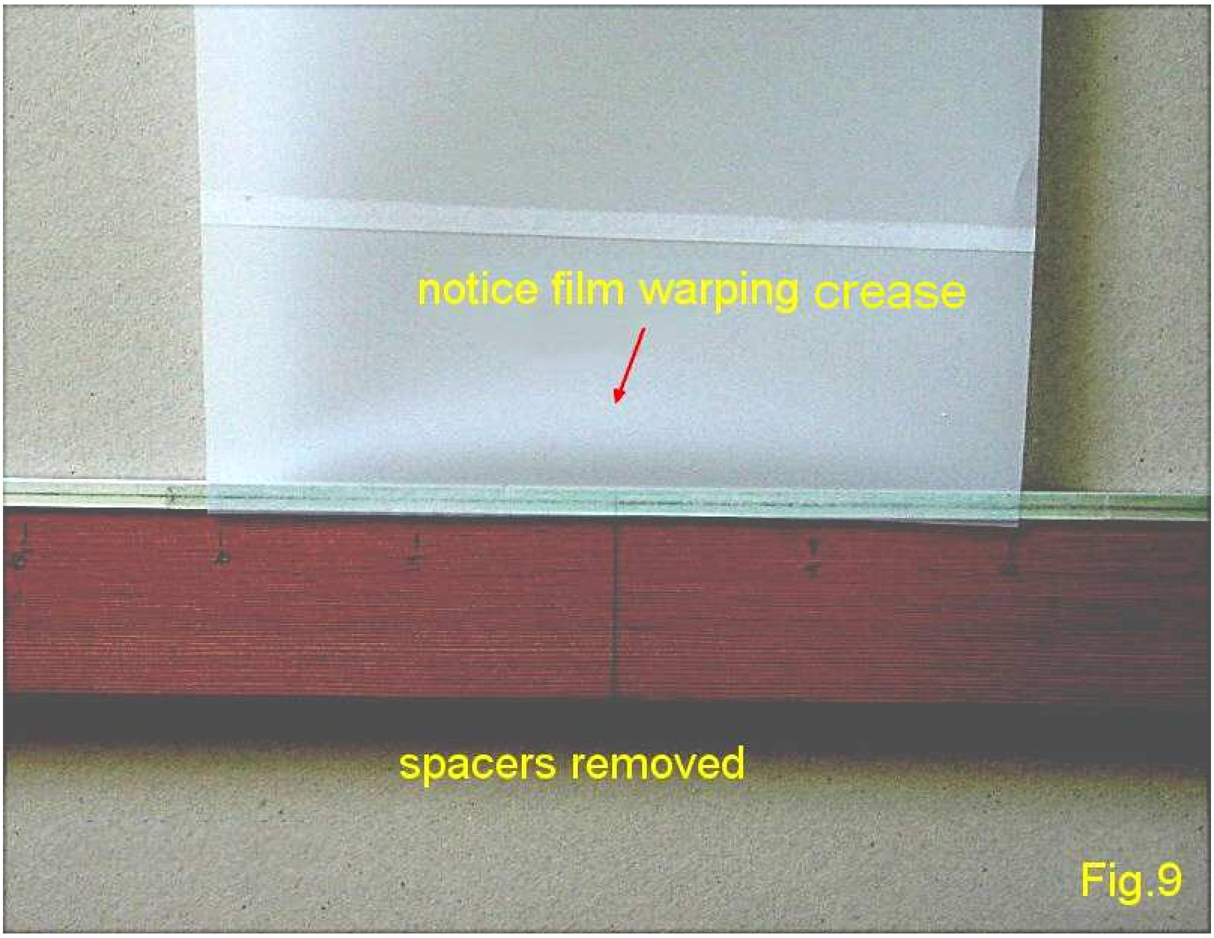
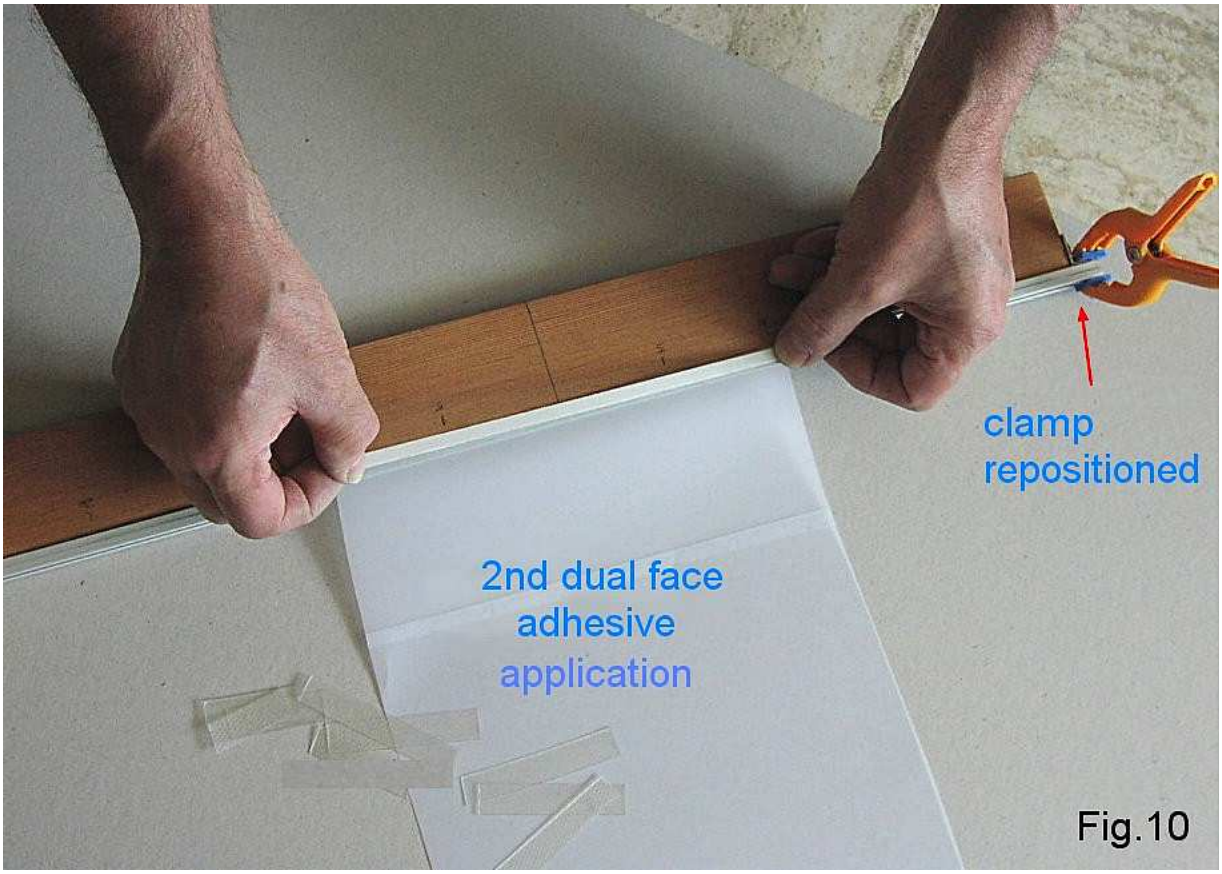


Fig.8


notice film warping crease
spacers removed
Fig.9


clamp
repositioned
2nd dual face
adhesive
application
Fig.10

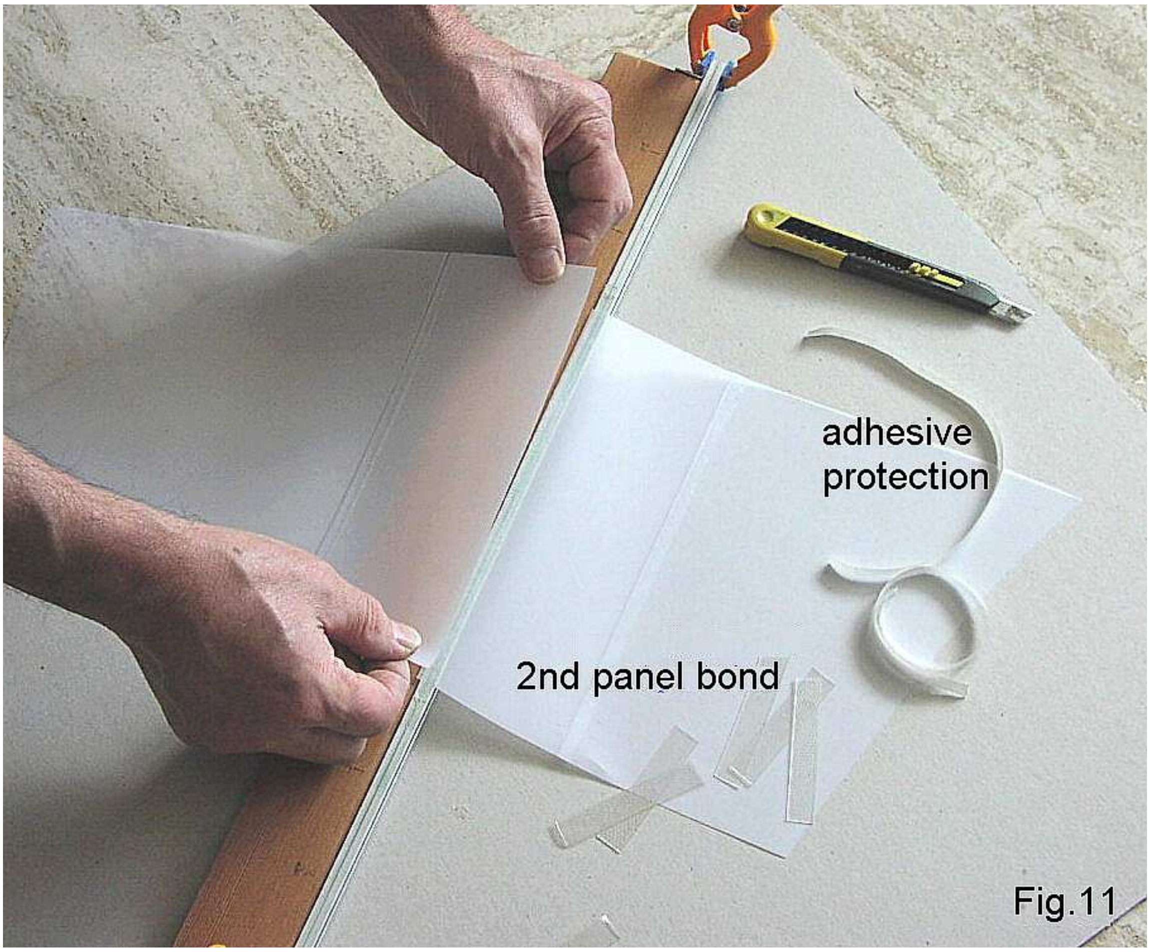


Fig.11

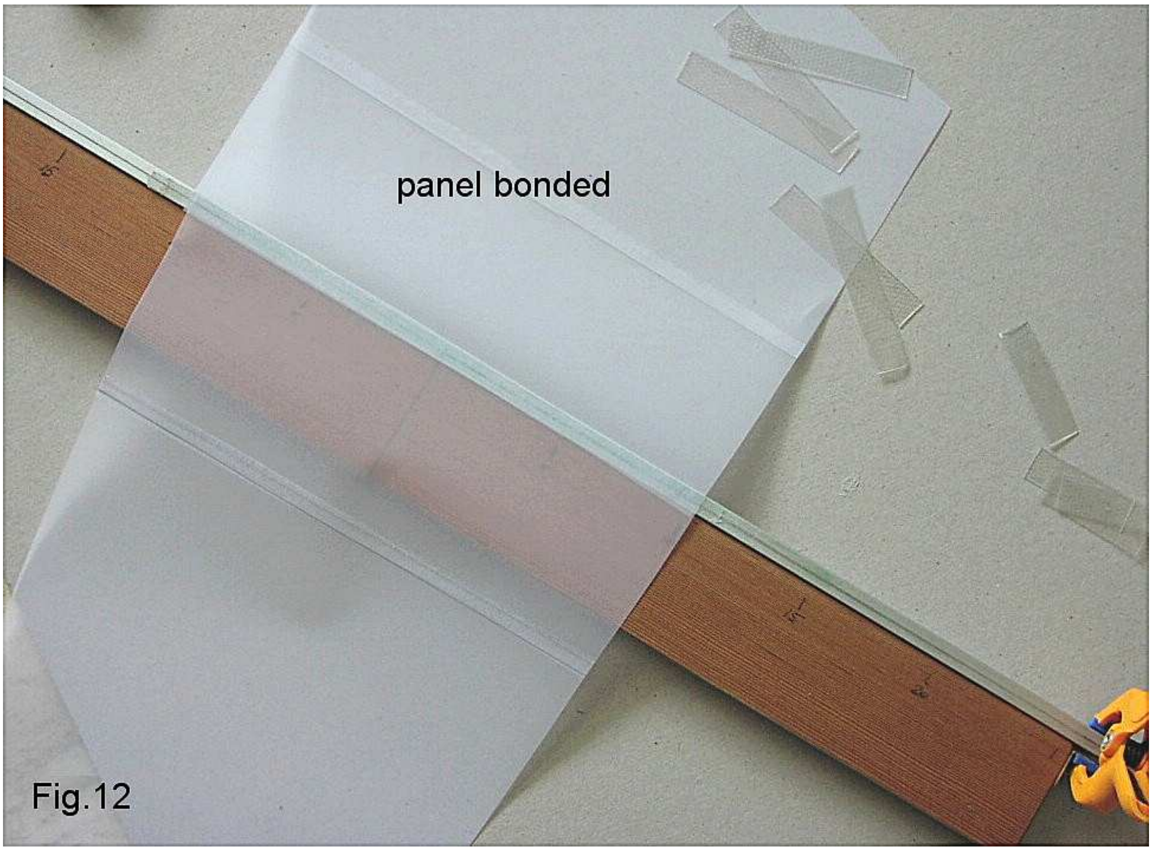
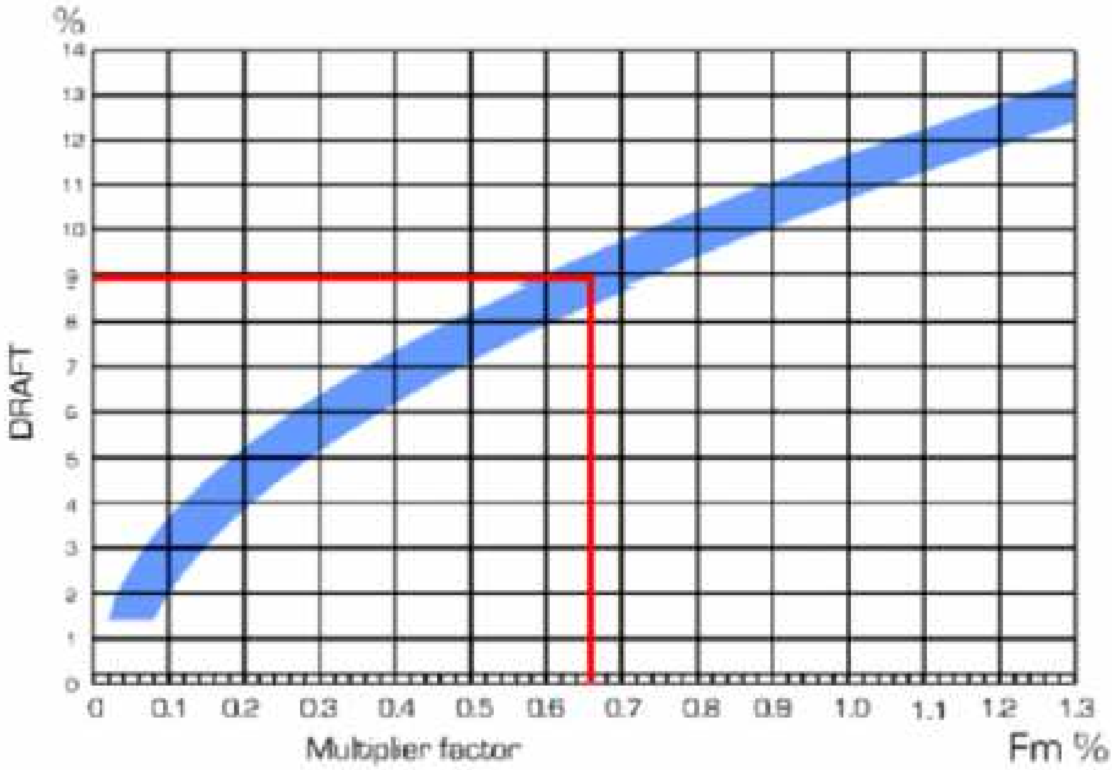


Fig.12


removal of 1st adhesive layer
with fingers, not easy, but ...
Fig.14


removal of 1st adhesive layer
with fingers, not easy, but ...
Fig.14

Practical application



Example:

Panel chord	260mm
Draft wanted	9 %
Multiplier	6.6%

therefore (260/100) x 0.66 = 1.71mm wedge

Each spacer shall have 1.7mm of thickness
See pictures 6 and 8

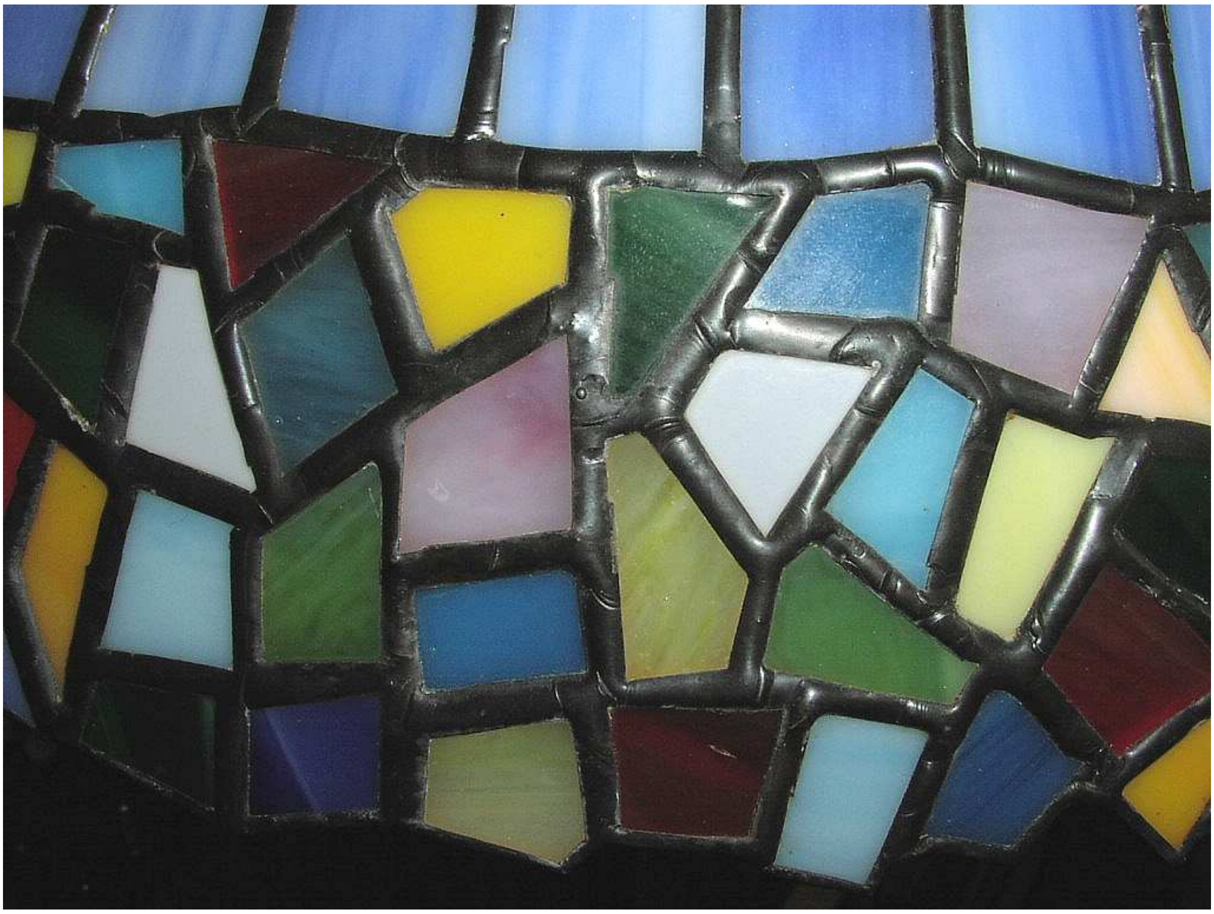
Stained Glass

Was the 1998 when, visiting an Antique Furniture Expo, in one corner of the large Stand someone was making a demonstration of Stained Glass.
He was a Master also teaching the techniques.
We went visiting his atelier and we decided to take lessons.
We were some 12 people and the course went on for almost one an half year.
Some one, at the end of the course, decided to open a shop for Stained Glass

Stained Glass is a composition of various pieces of Colored Glass and retained by lead stripes.
Lead stripes called "cames" are often available with "H" and "U" shape of different dimensions to be compatibles with the Glass thickness.

Myself, I decided to familiarize with the Tiffany glass technique.
Each piece of glass is covered on the edge with a self-adhesive copper ribbon.
Several pieces are then soldered together with tin-lead alloy and iron.

A detail of one of my works:

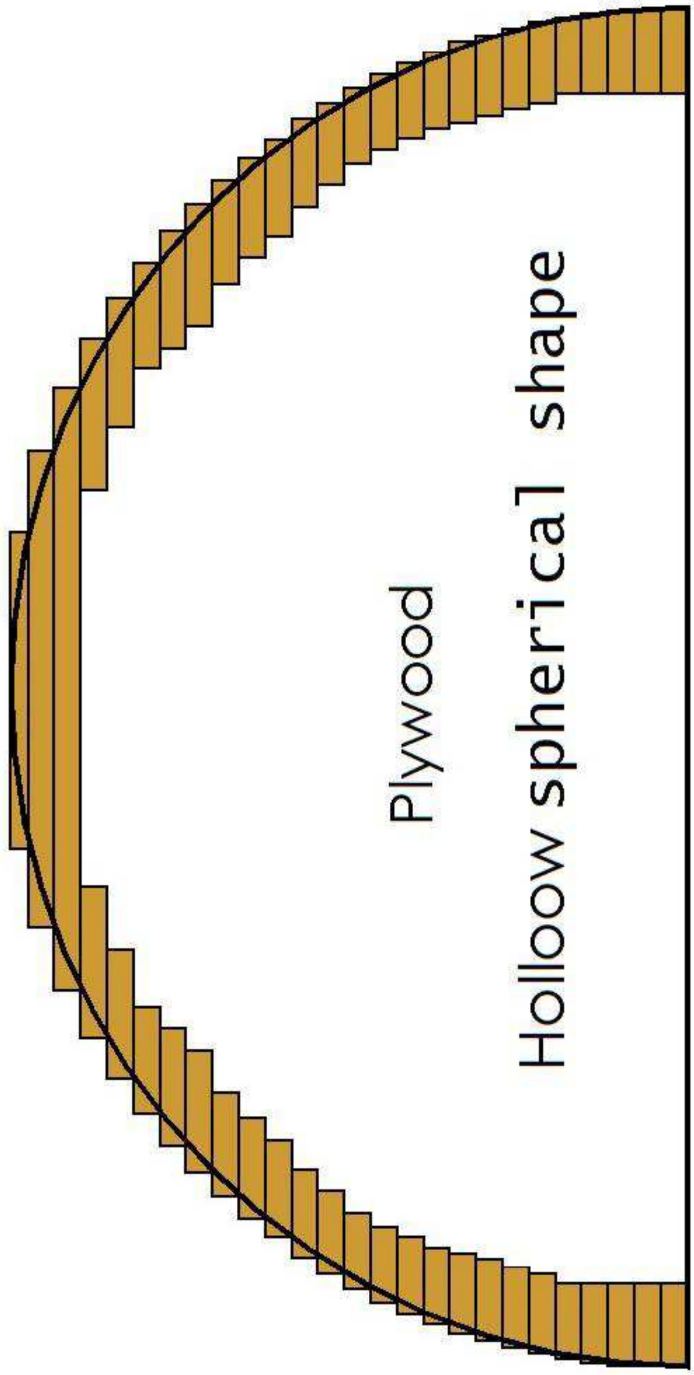


Once the work completed a patina is applied to darken the tin-lead solders.

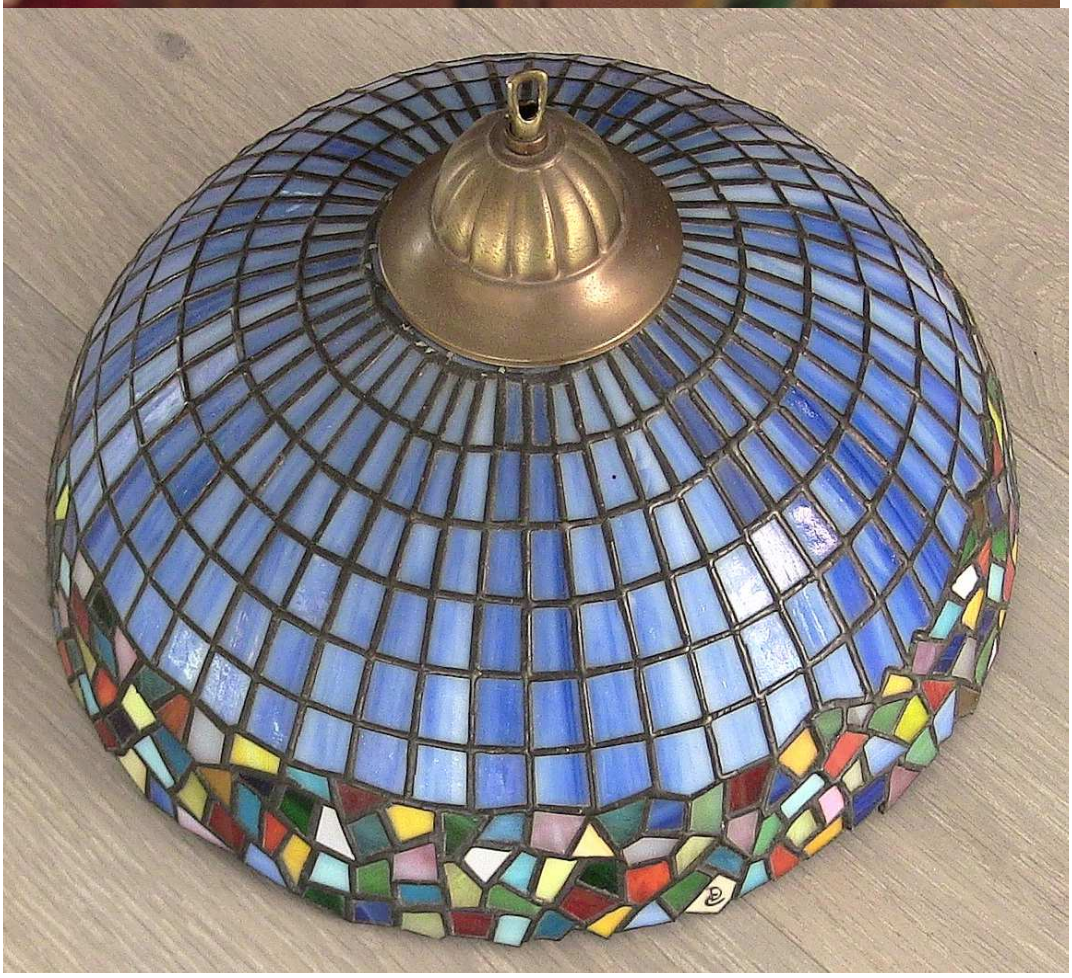
The full shade is in next page.

This is the final act of a work that may last several weeks.

The shapes are obtained with wooden forms previously made.
My technique consists in superposing several plywood circular shapes.
The shapes are of course bonded with adhesive.
The final shape is a matter of rasping and sand papers.



All the shades are of my personal design



Harlequin lamp

My first Tiffany Lamp

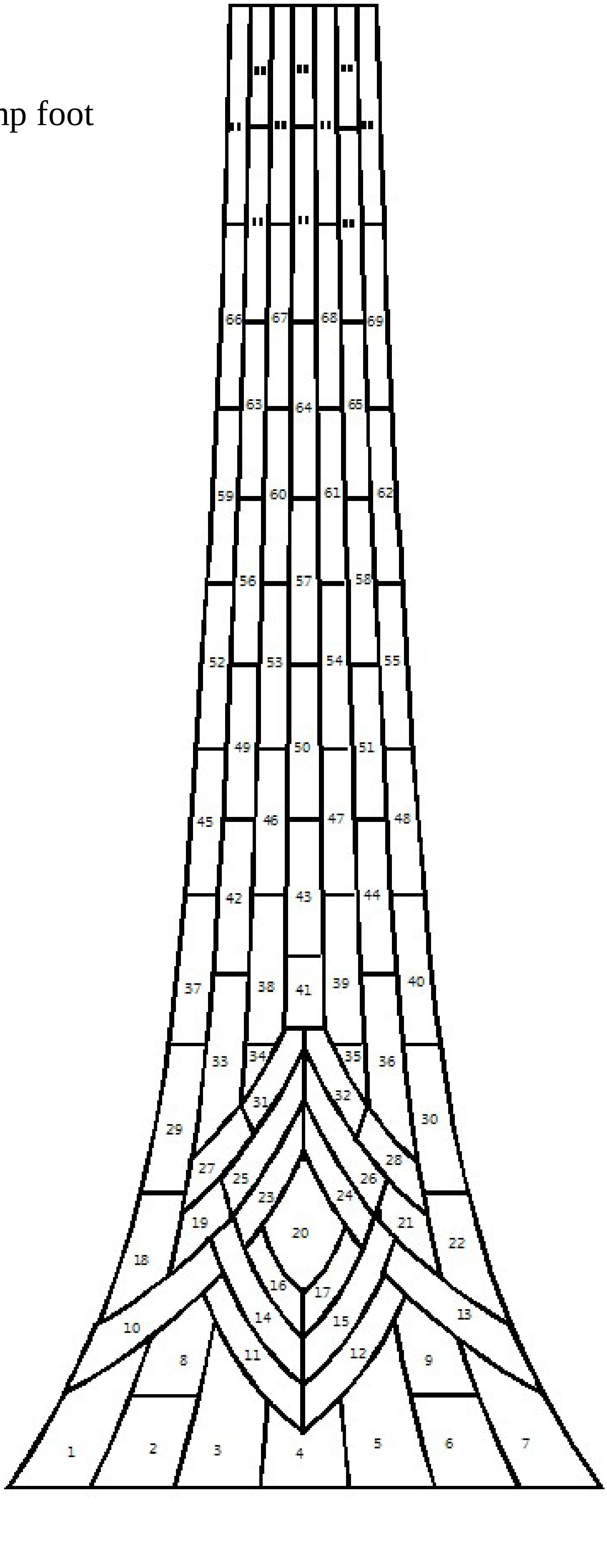
Two views of the same lamp

Details of the shade of 80cm of diameter next page

Water Lily shade

50cm diameter

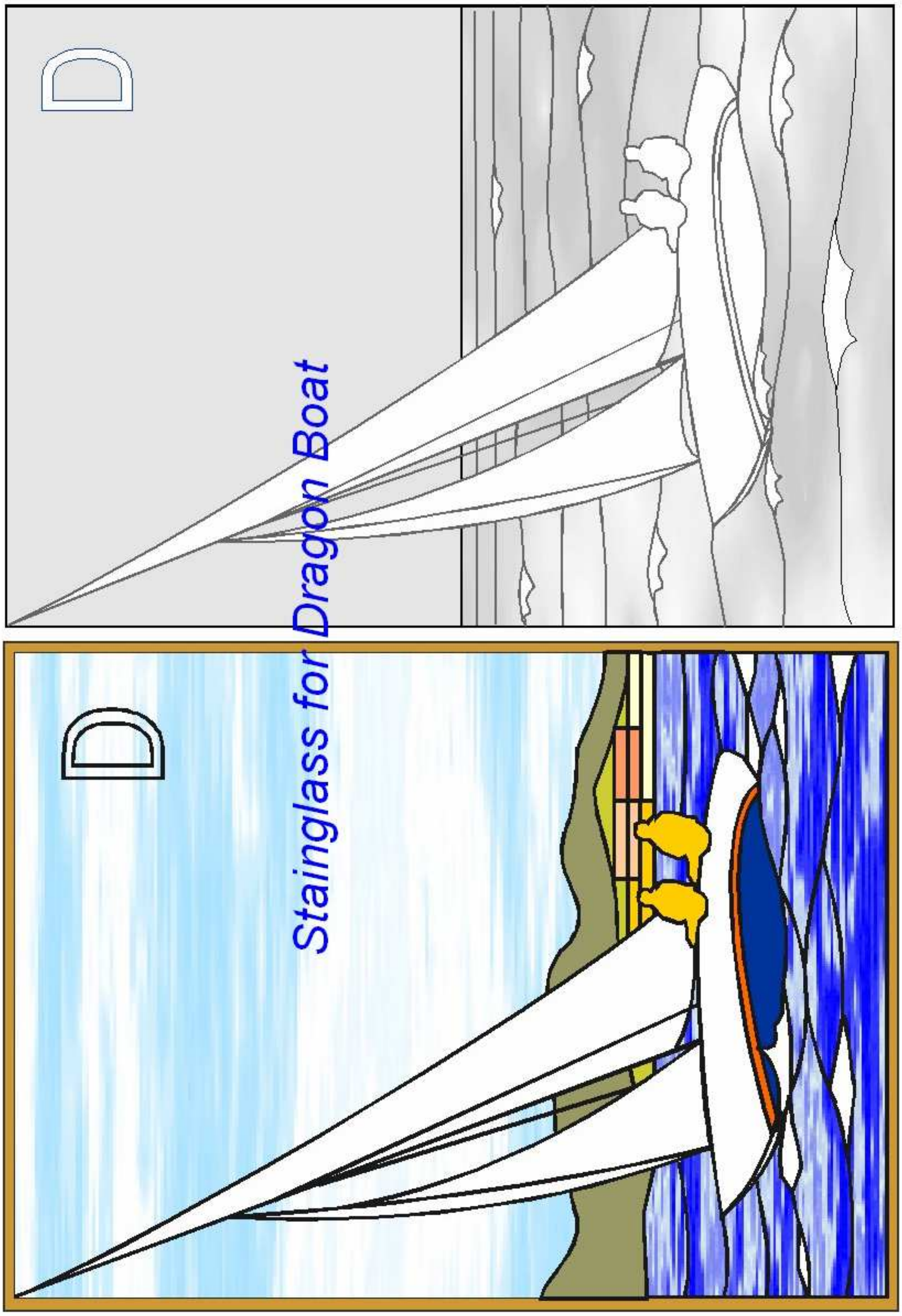
Drawing the lamp foot



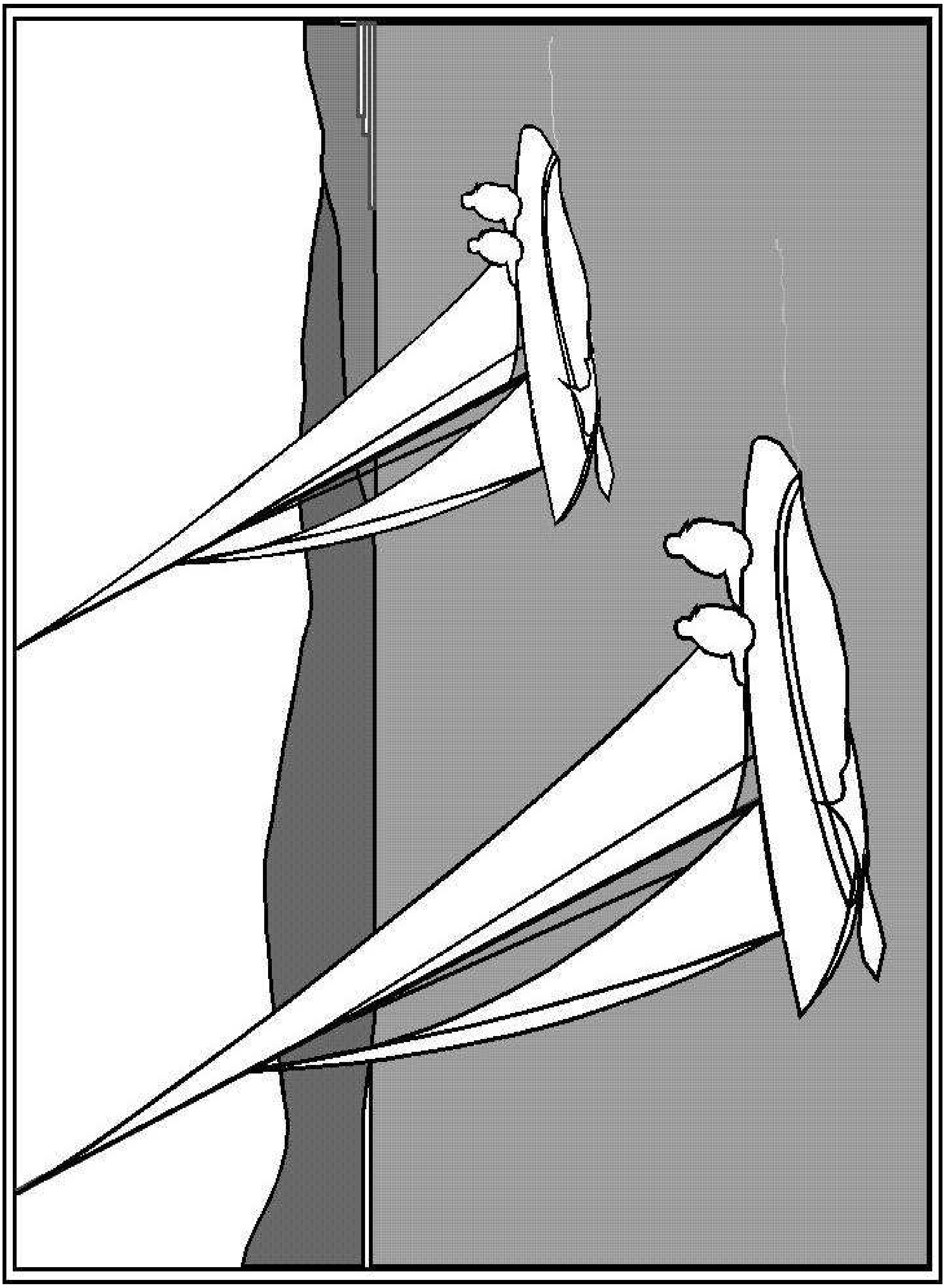
The Peacock Lamp

Suspended to the ceiling

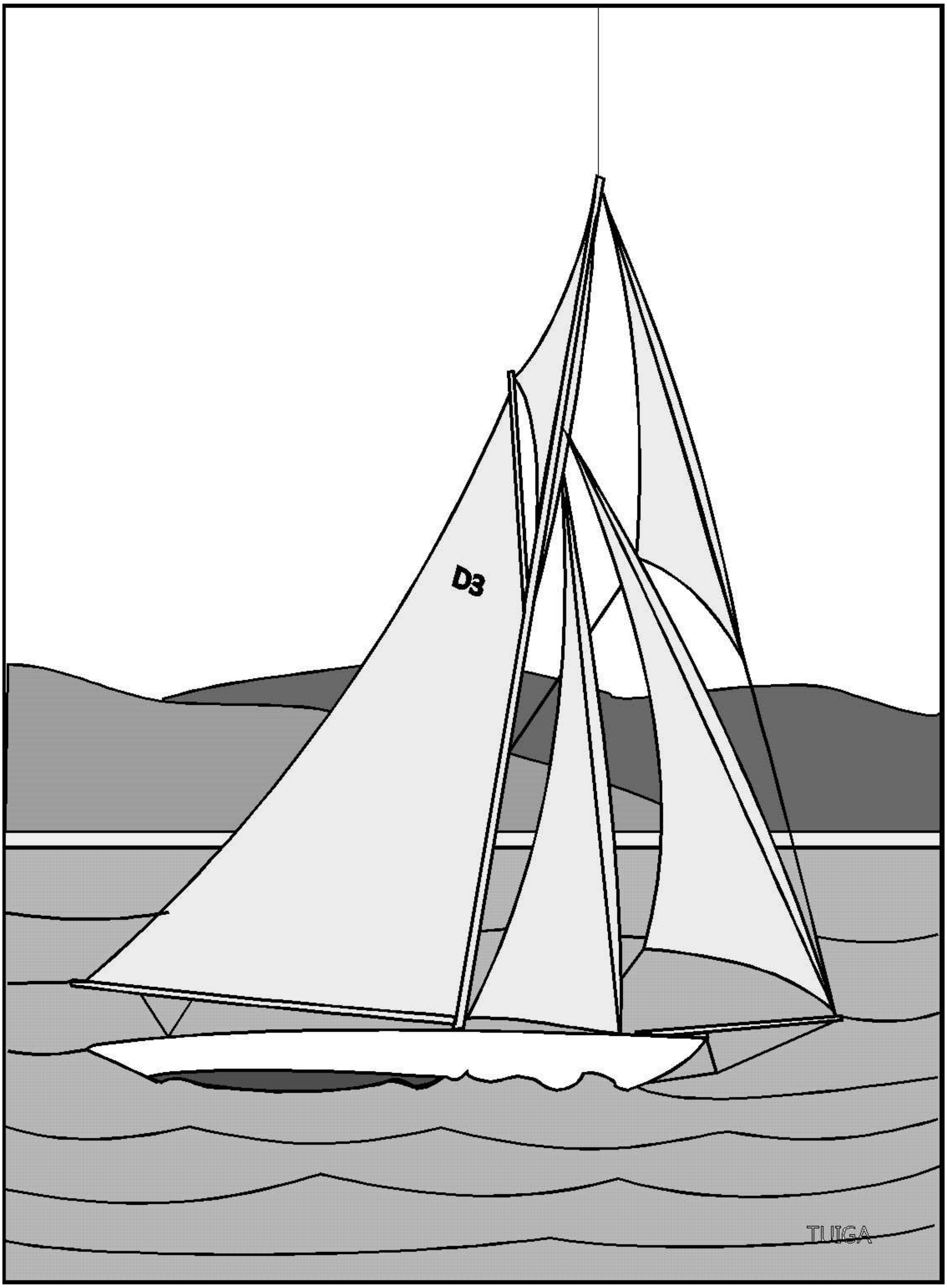
Suspended to the ceiling



Some artistic drawings about Dragon



Artistic interpretation of racing Dragons



TUIGA

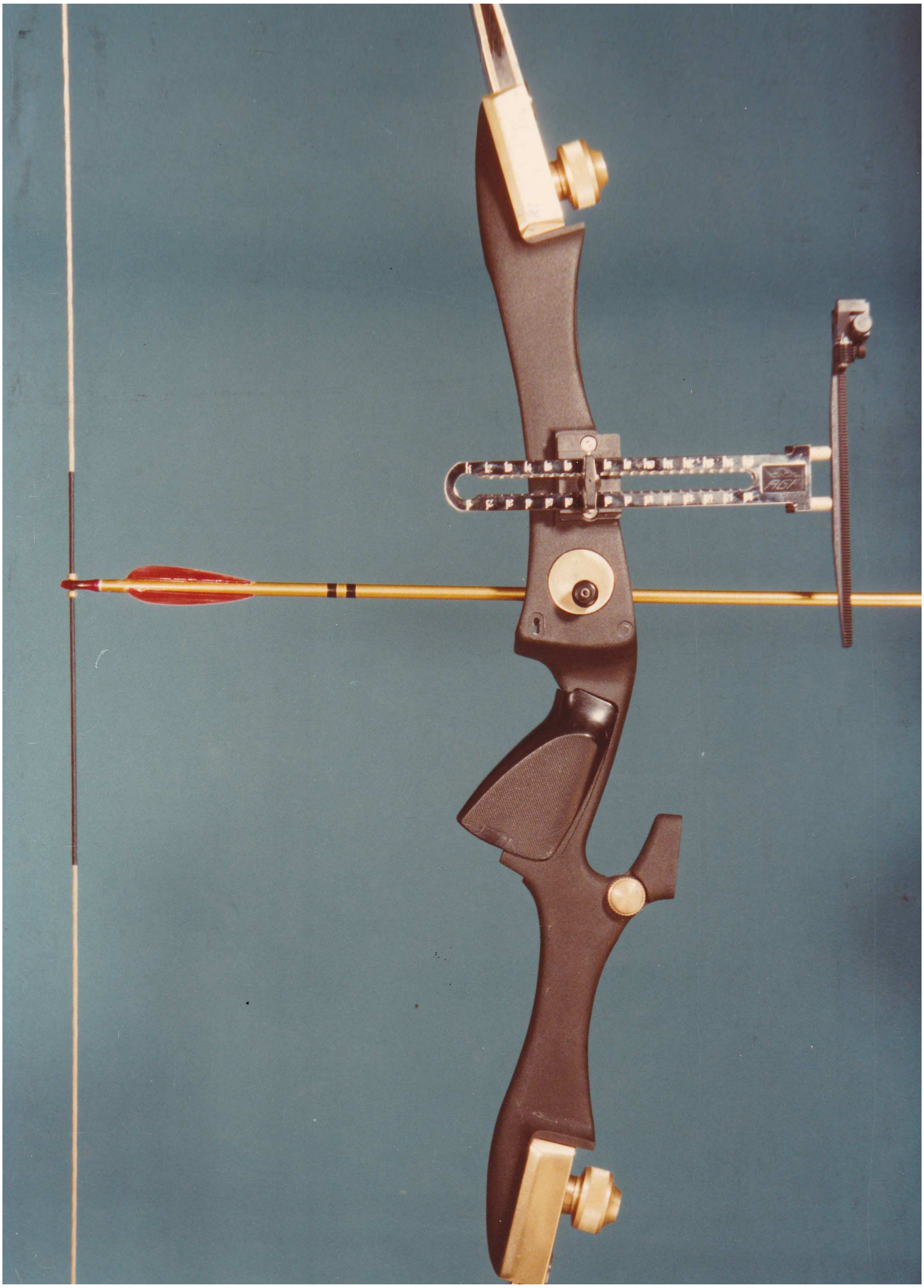
IRIS

Out of the Bin

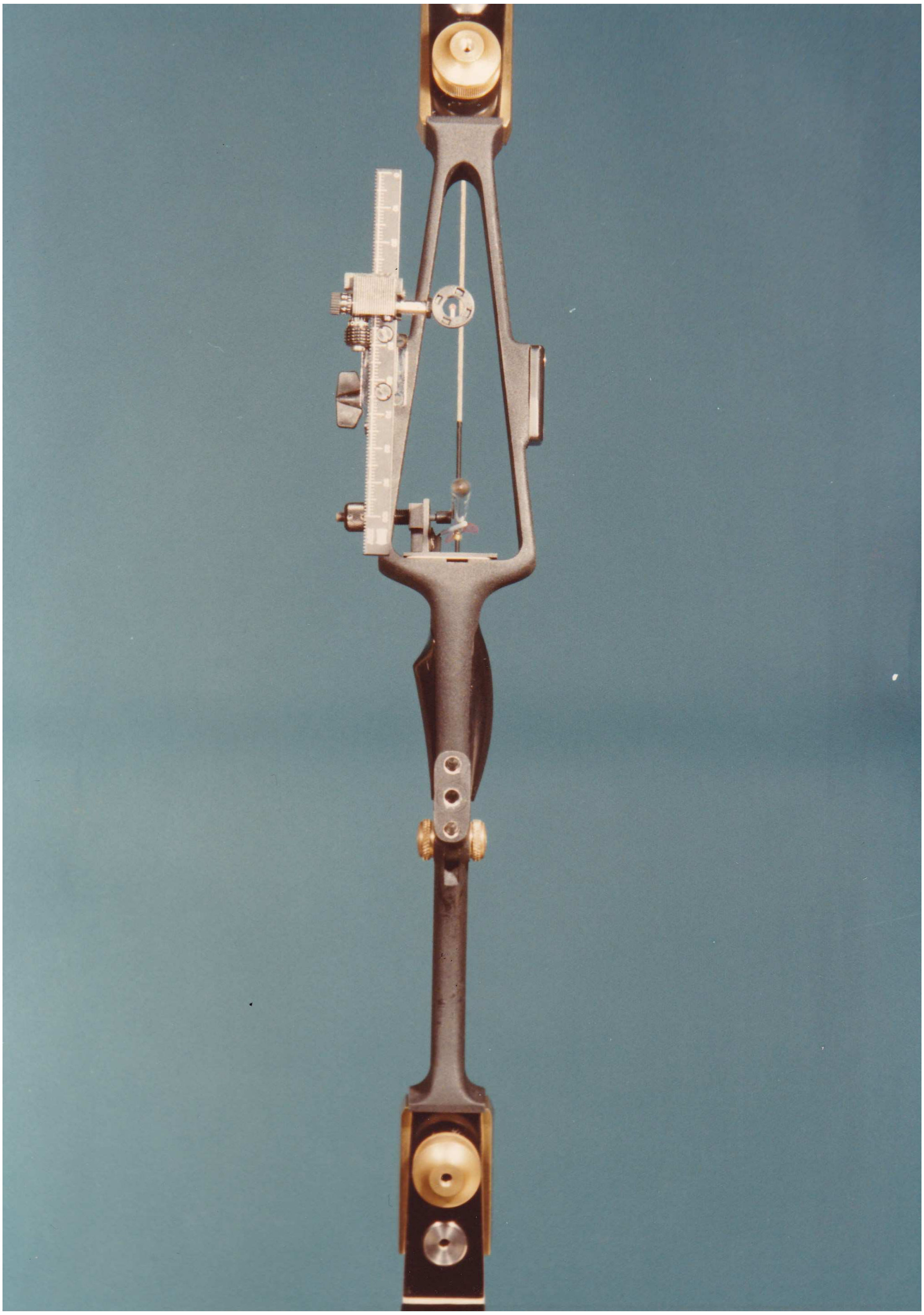
I like archery; years ago I was member of a Club close to Toulouse.
5 years of Competitions from 1984 to 1989 until the work permitted.

My Bow design of 1984

Side view



Front view



Finally the Company that has made the above prototype abandoned the production since for them was not economically interesting. Today, after 35 years, 50% of bows use central window!

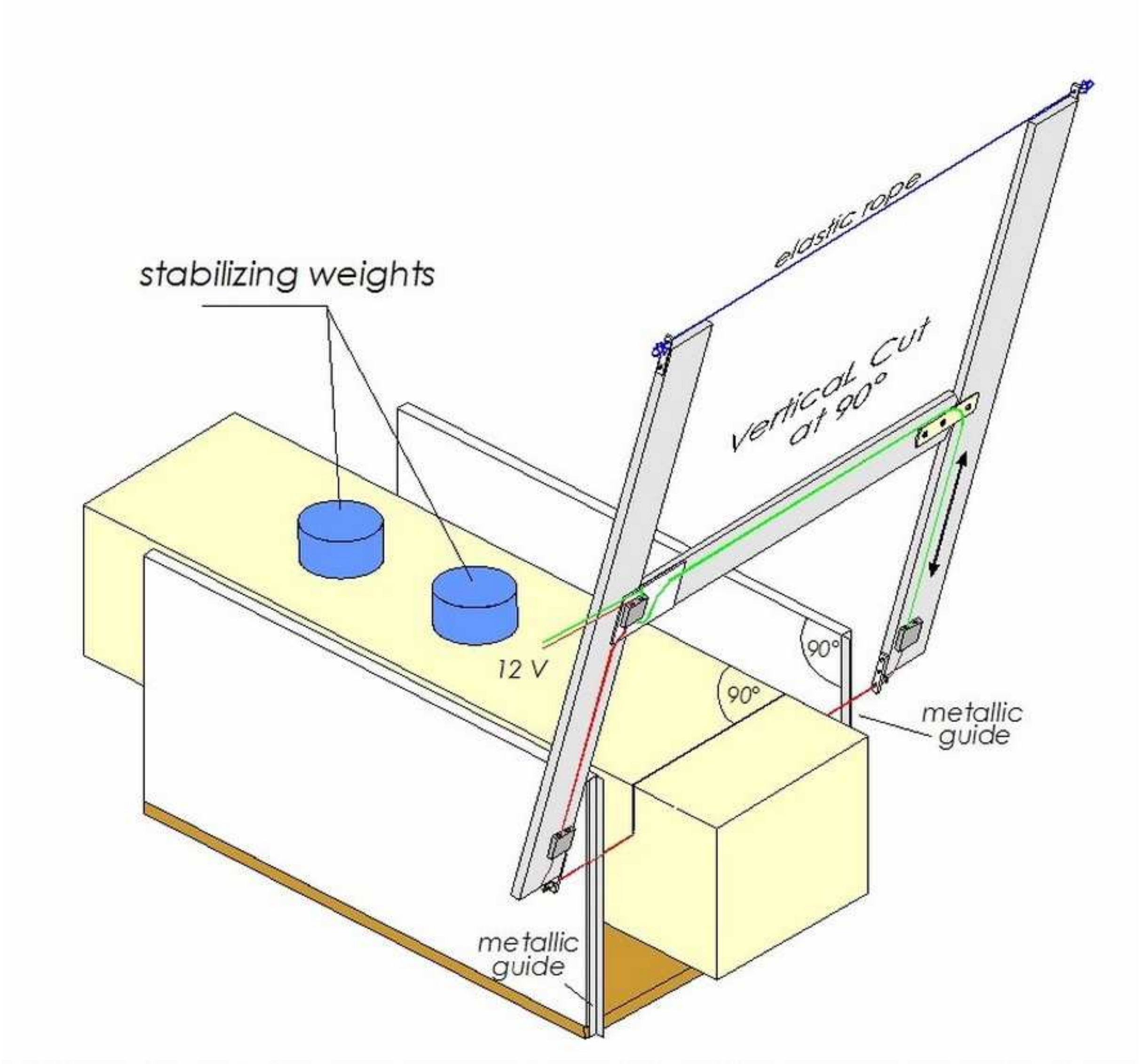
Another game!


BLACK MAGIC
IL MORO
YOUNG AMERICA
AZZURRA
1mm Triplex
America Models
at 100 : 1

Just for Fun

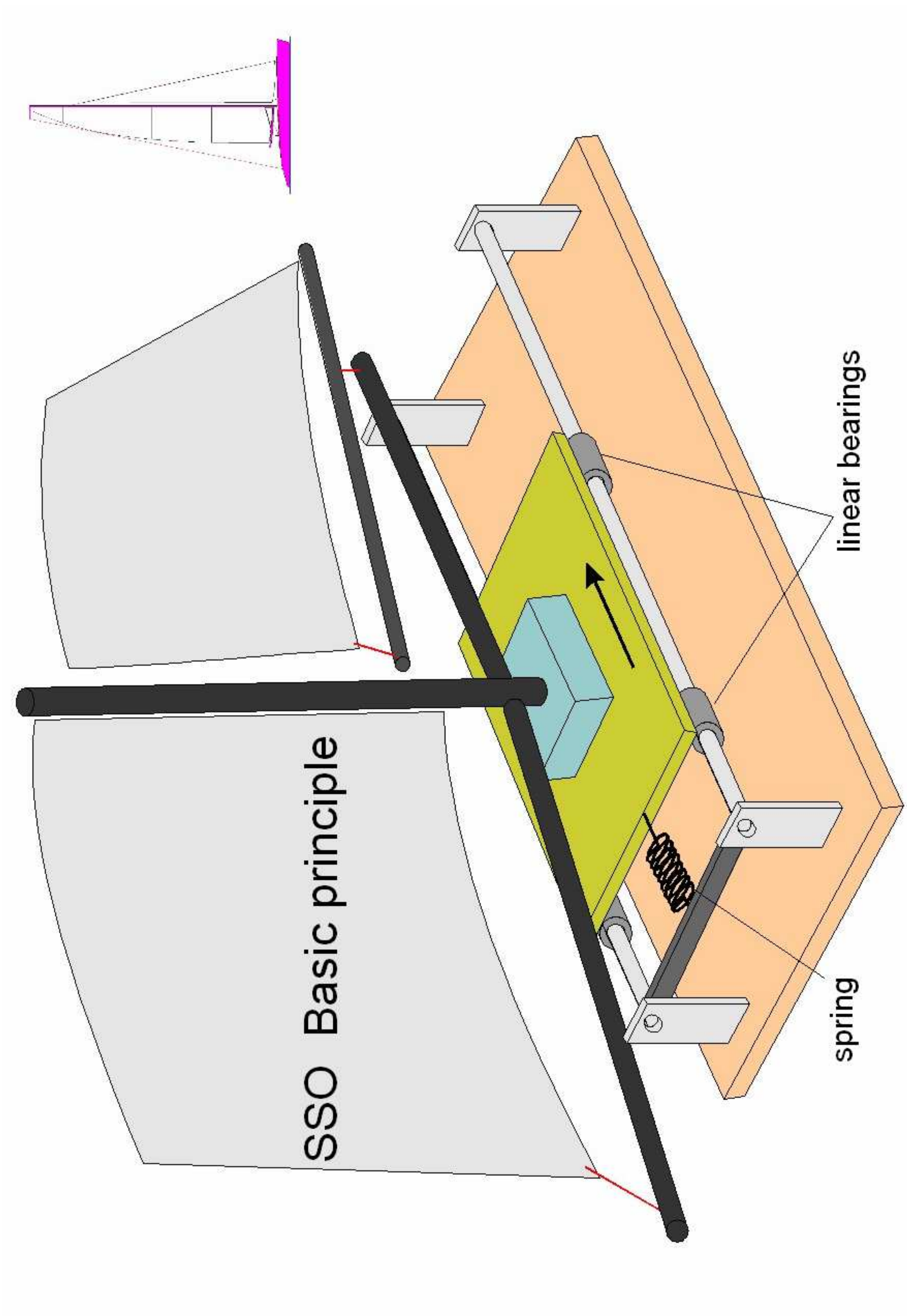

NZL-32
1/100
made in
1996
TVNZ
TOYOTA
V5 HI-TECPOINT 0.5

Hot Wire Cutter

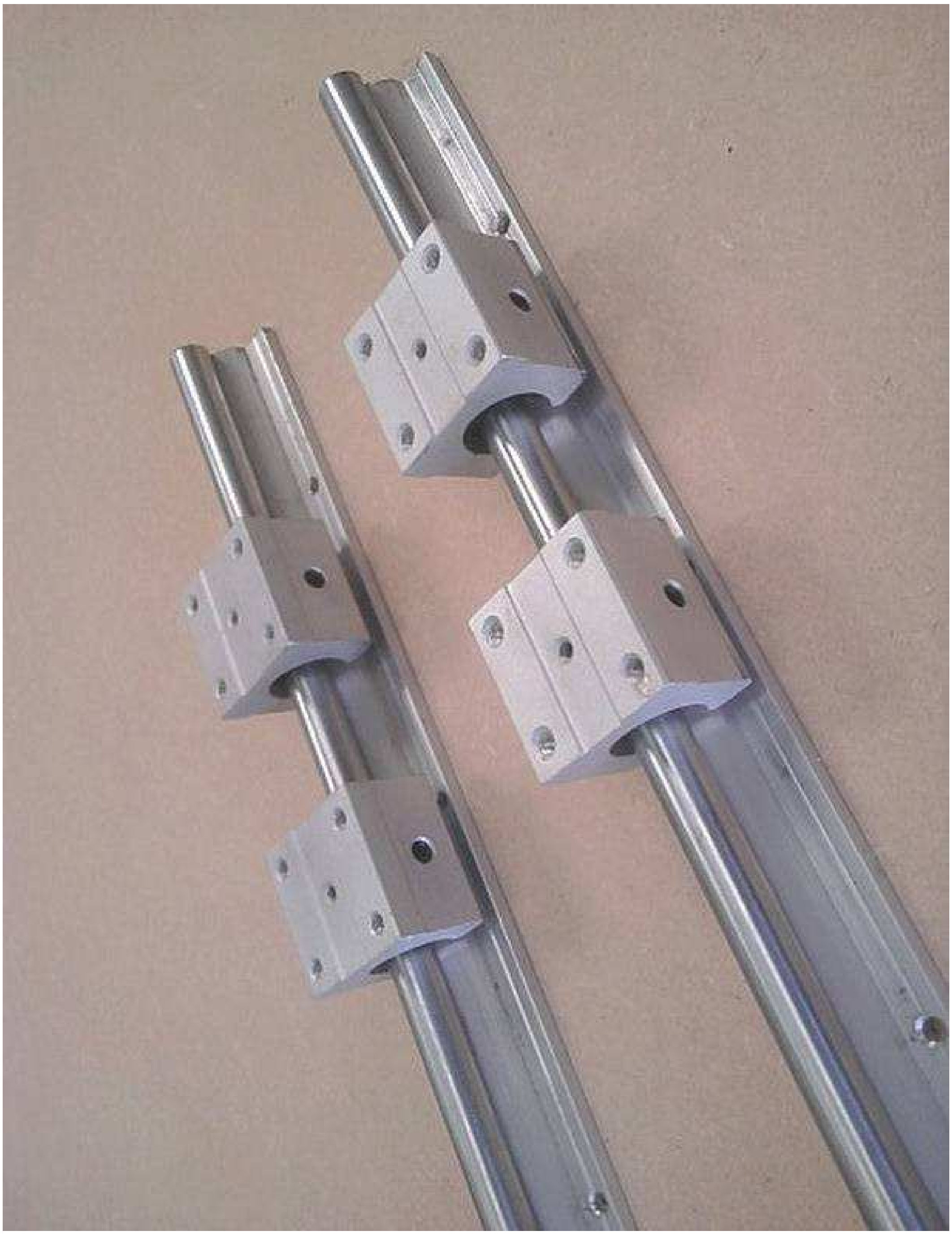


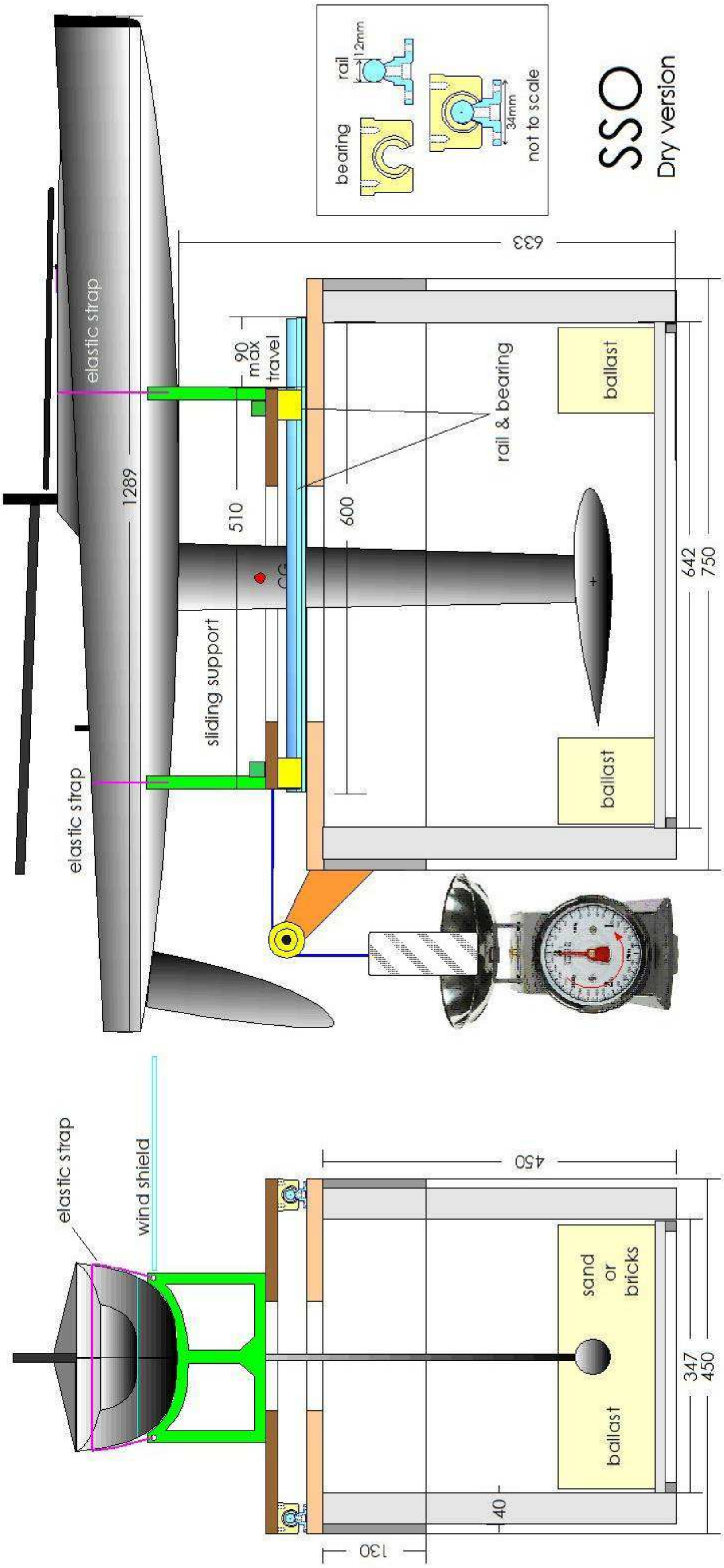
All corners at 90°

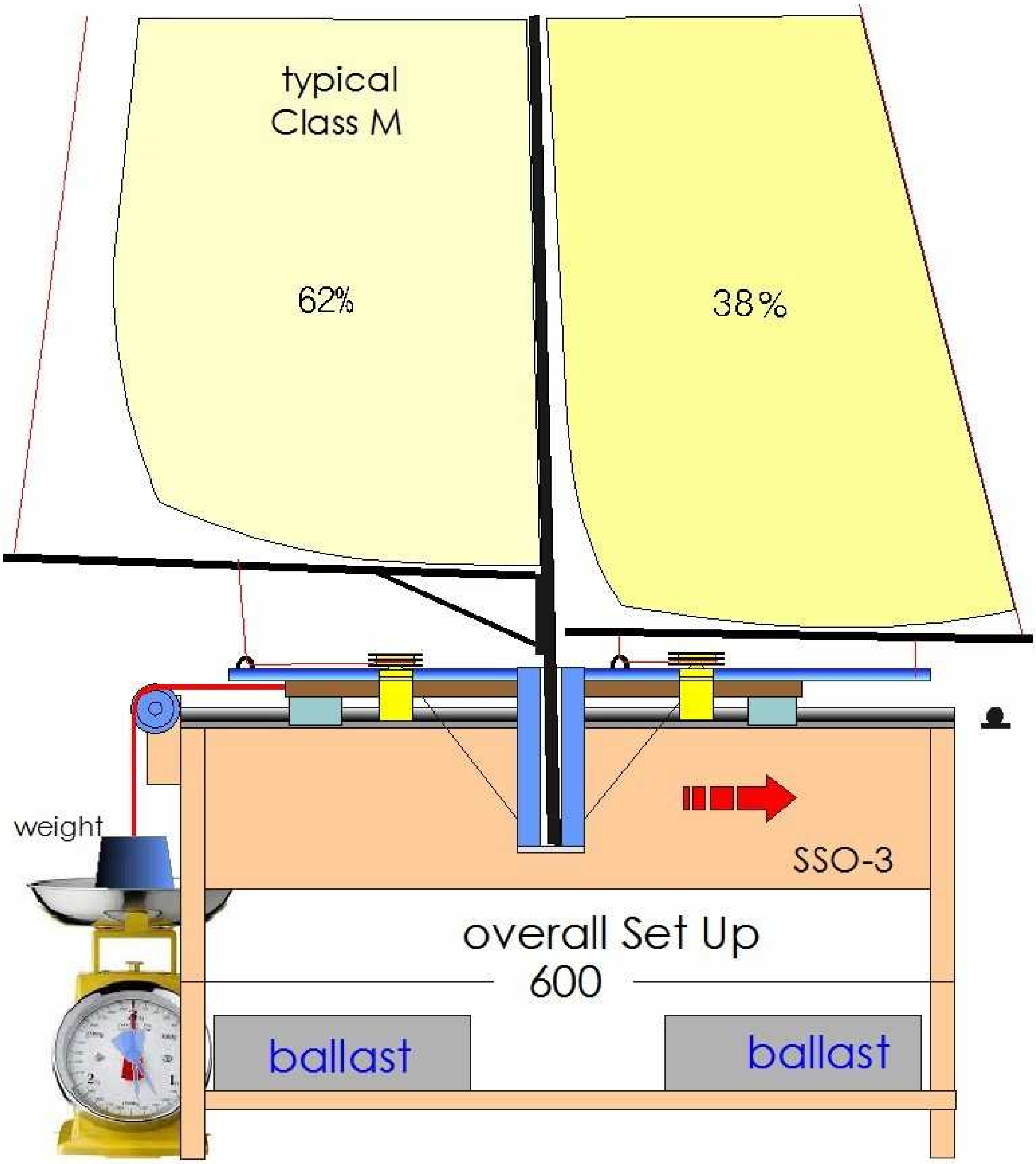
SSO – Sail Setting Optimizer
Construction underway

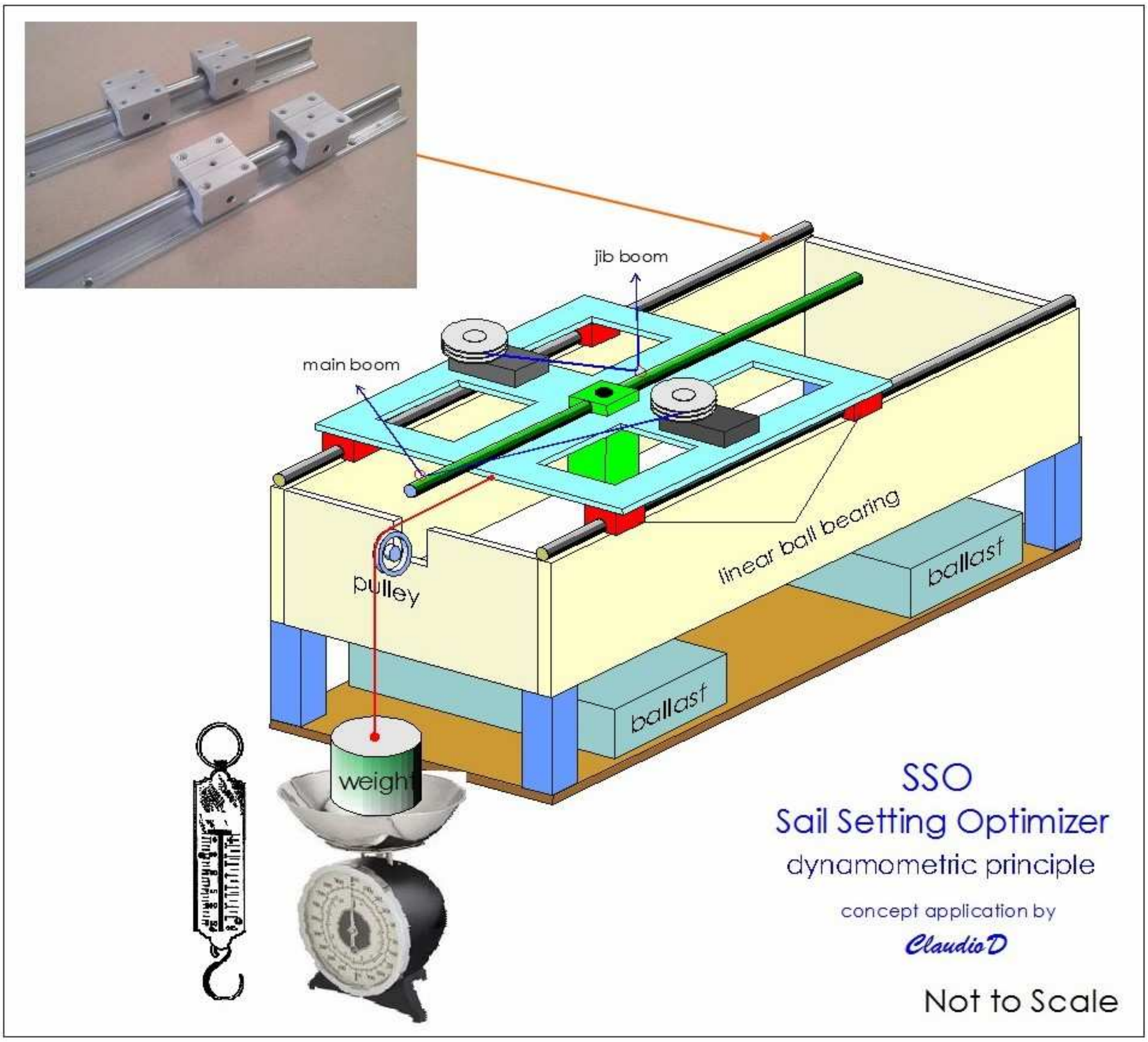


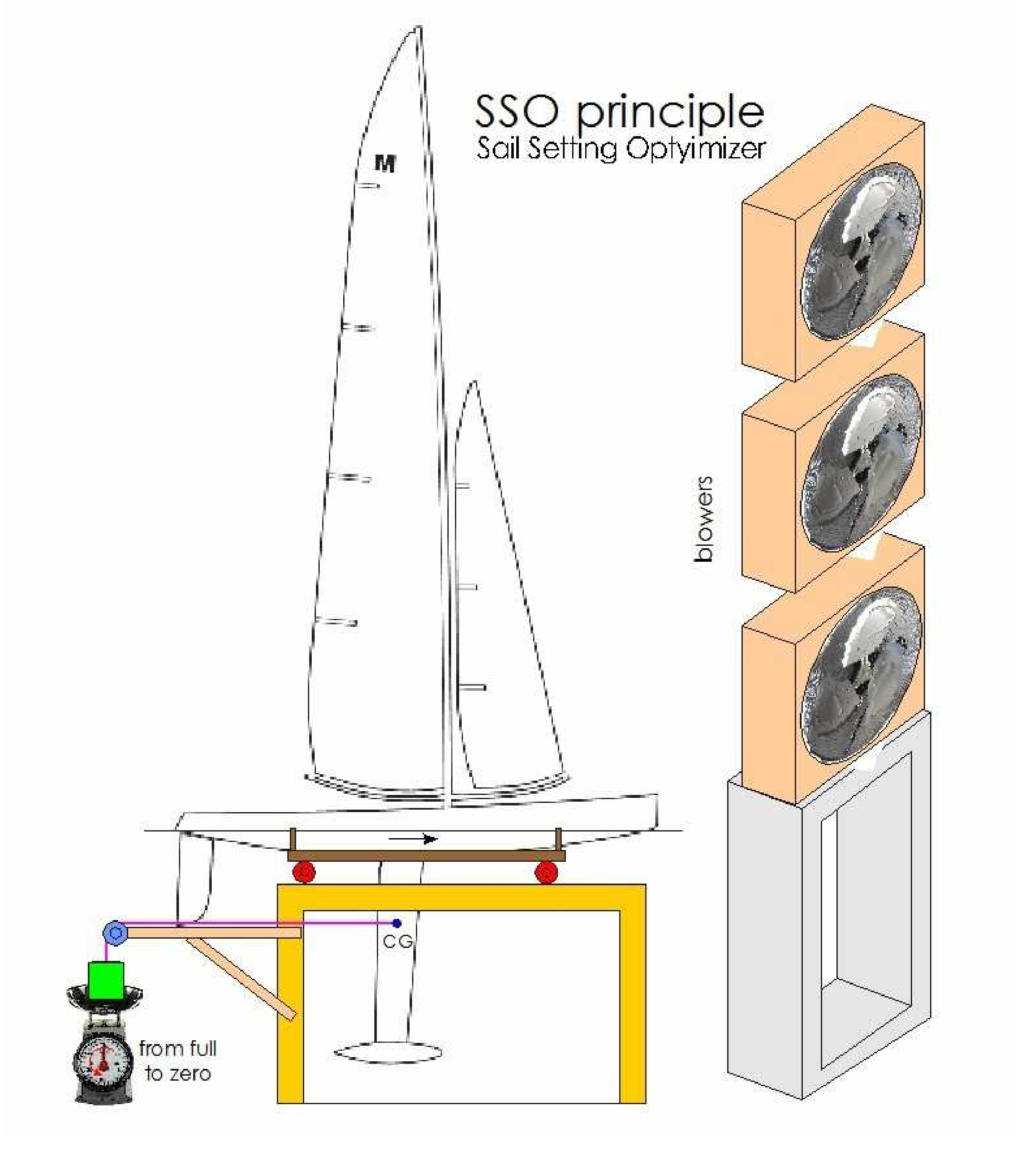
Linear bearing




SSO
Dry version
bearing
rail
12mm
34mm
not to scale
633
elastic strap
1289
90
max
travel
510
600
sliding support
CG
rail & bearing
ballast
ballast
642
750
elastic strap
wind shield
450
sand
or
bricks
ballast
347
450
40
130

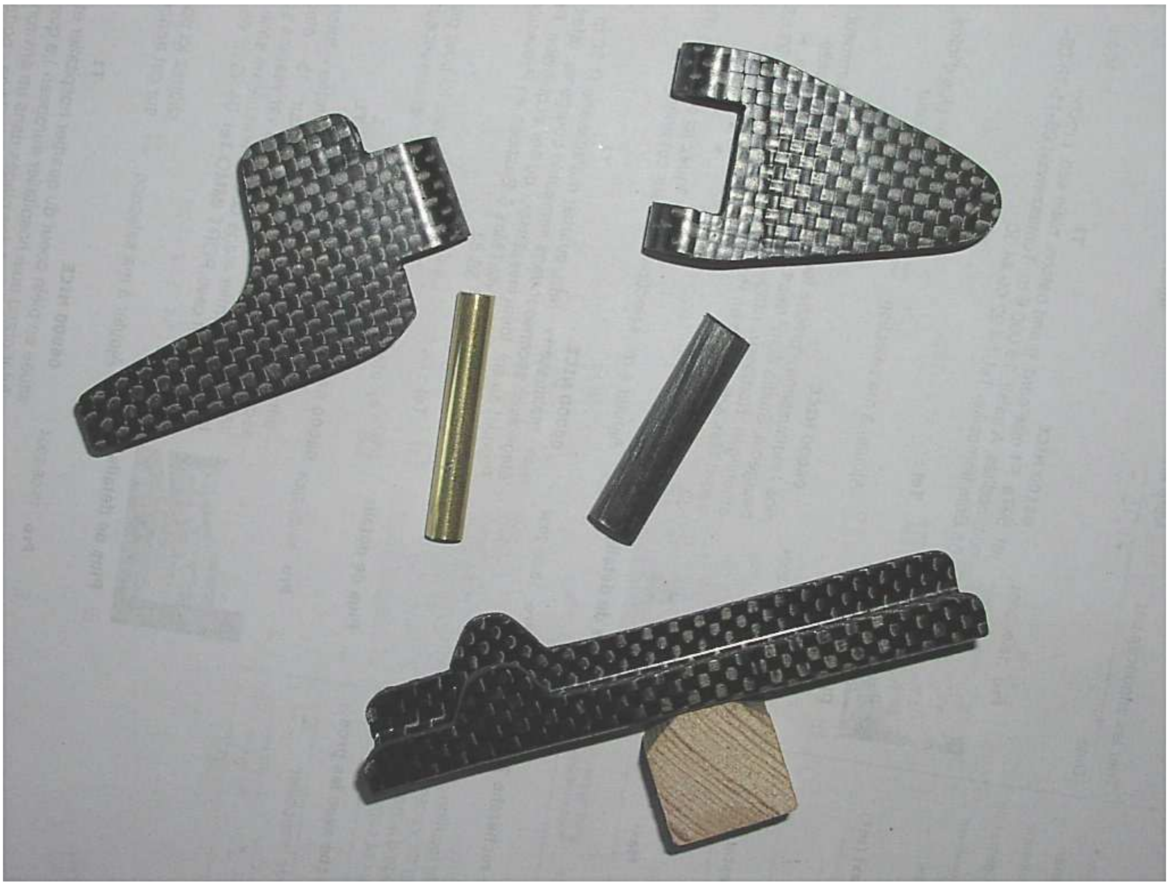

typical
Class M
62%
38%
weight
SSO-3
overall Set Up
600
ballast
ballast


jib boom
main boom
pulley
linear ball bearing
ballast
ballast
weight
SSO
Sail Setting Optimizer
dynamometric principle
concept application by
ClaudioD
Not to Scale


SSO principle
Sail Setting Optyimizer
M
blowers
CG
from full
to zero

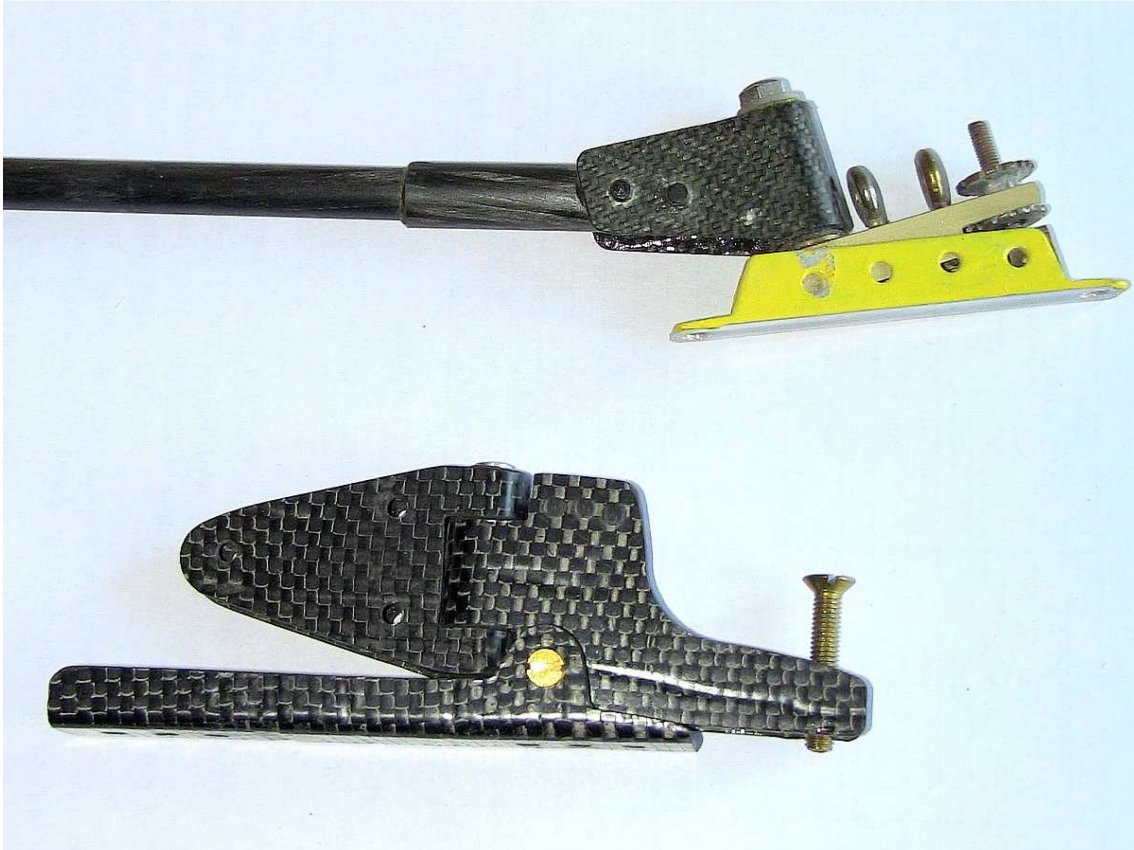

SailMaking Blocks
FIOCCO
12%
10%
8%

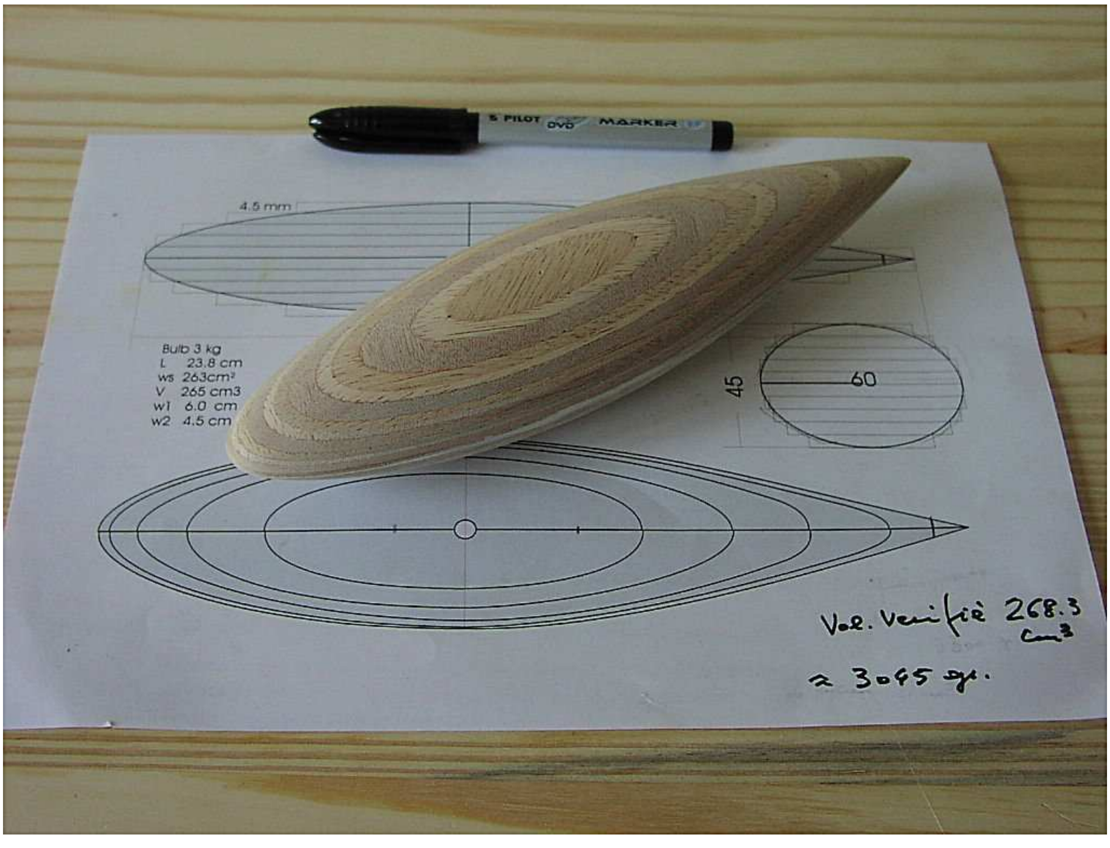
Mahogany Strip planking Hull



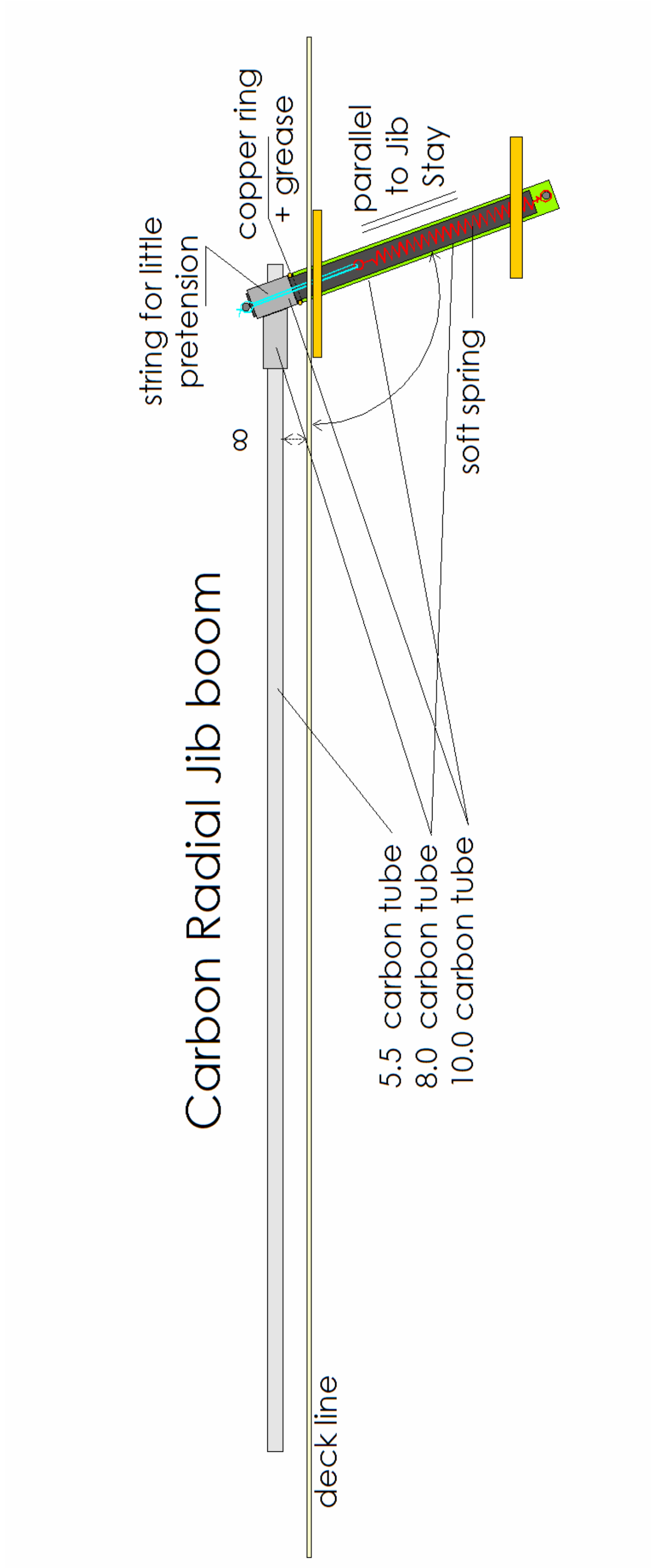
Full carbon RADIAL boom Hinge

previous design



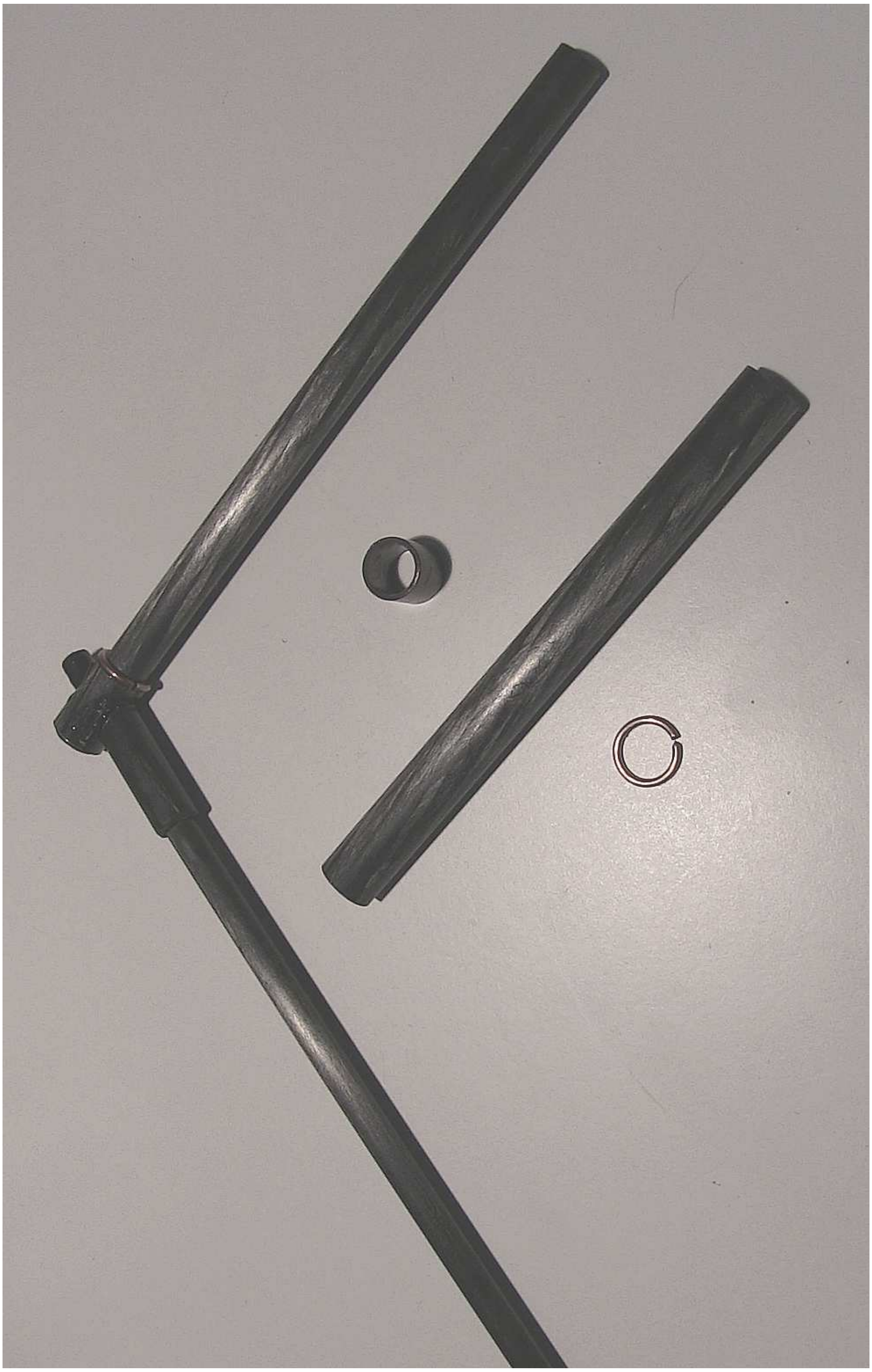


Radial Boom design

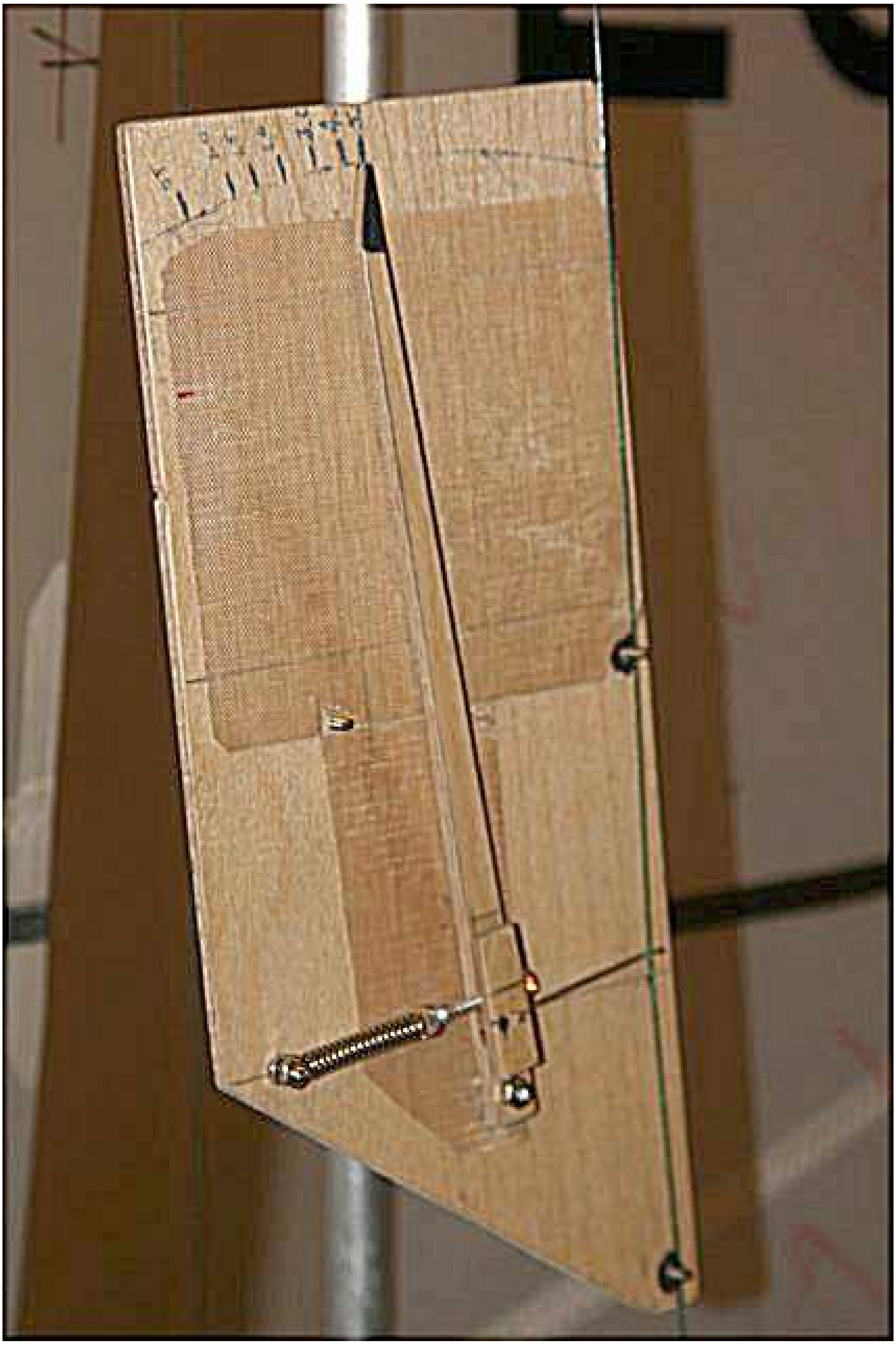


Prototype future Radial Boom

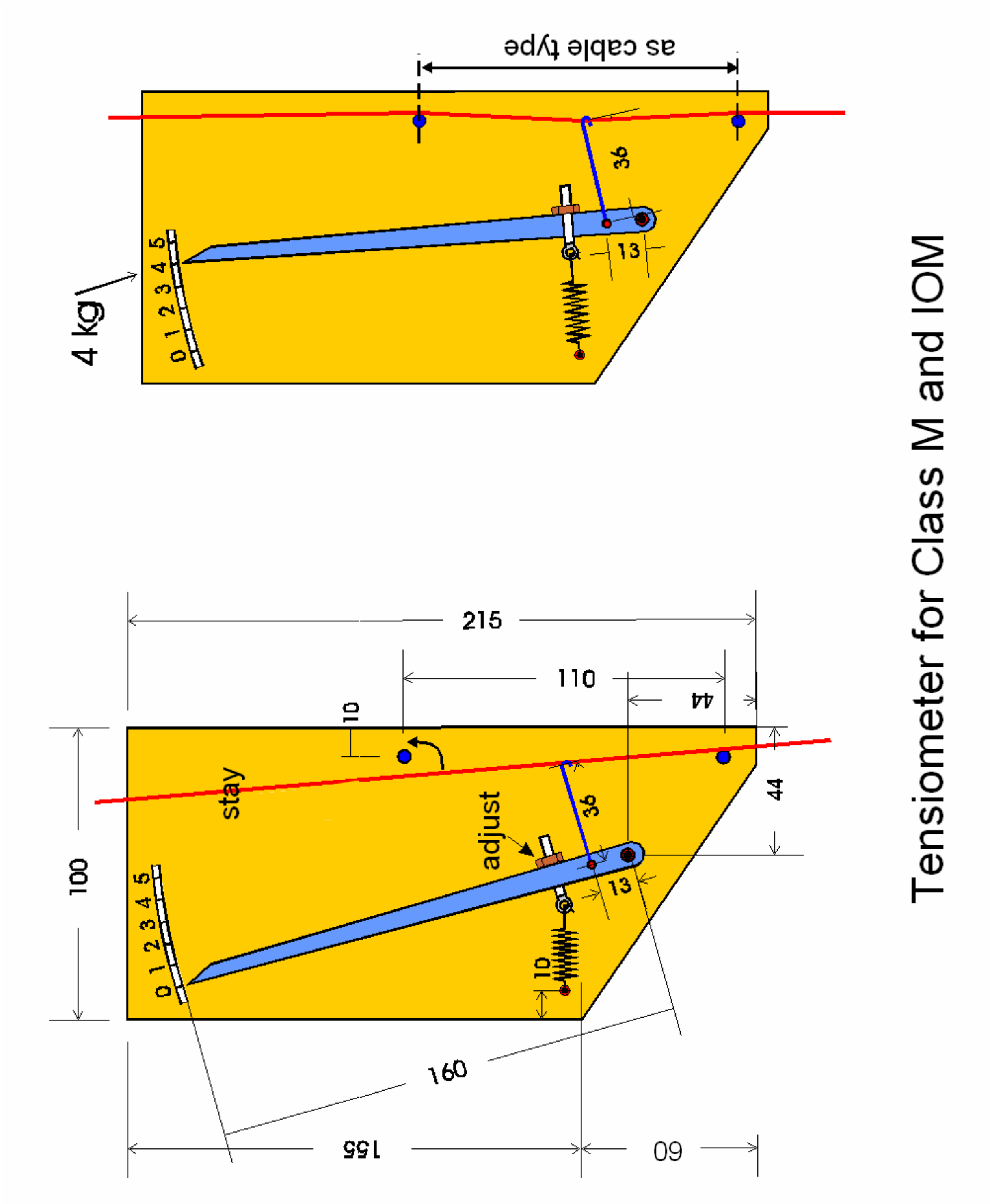
/



From my Friend Pierre



Tensioner Prototype

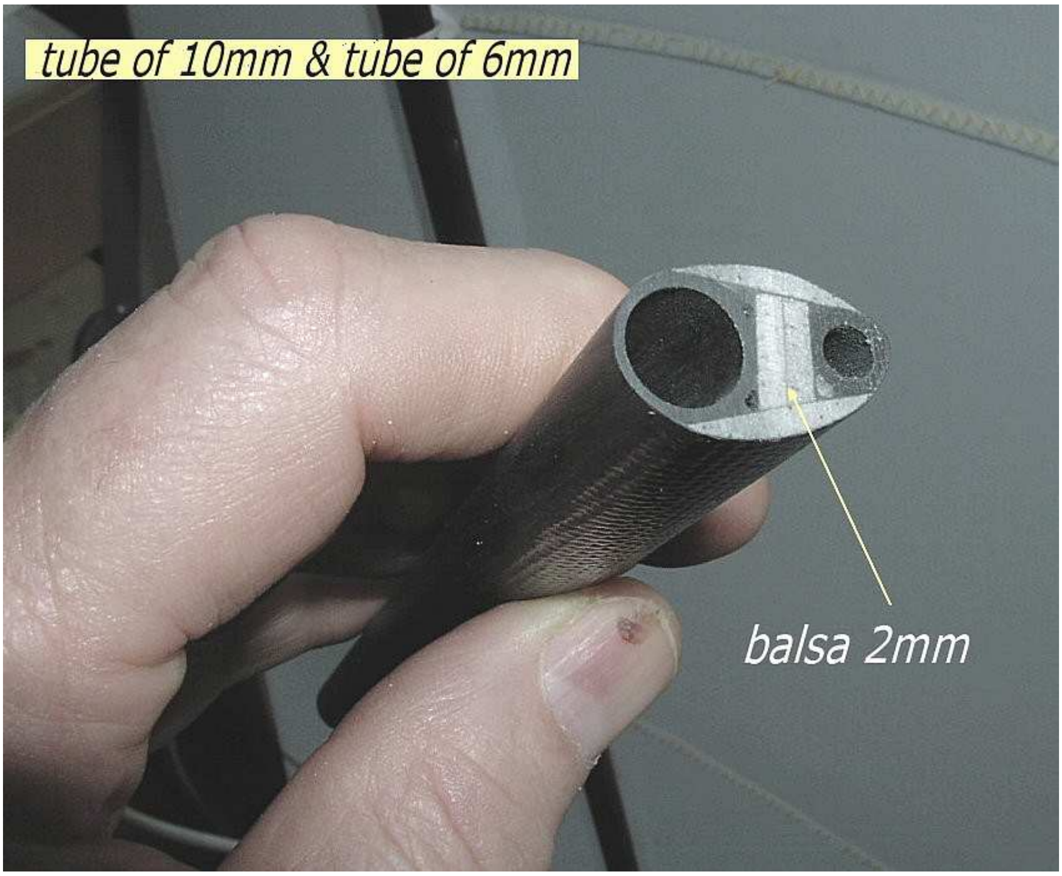

Tensiometer for Class M and IOM
as cable type
4 kg
0 1 2 3 4 5
36
13
stay
adjust
215
110
44
10
100
160
155
60

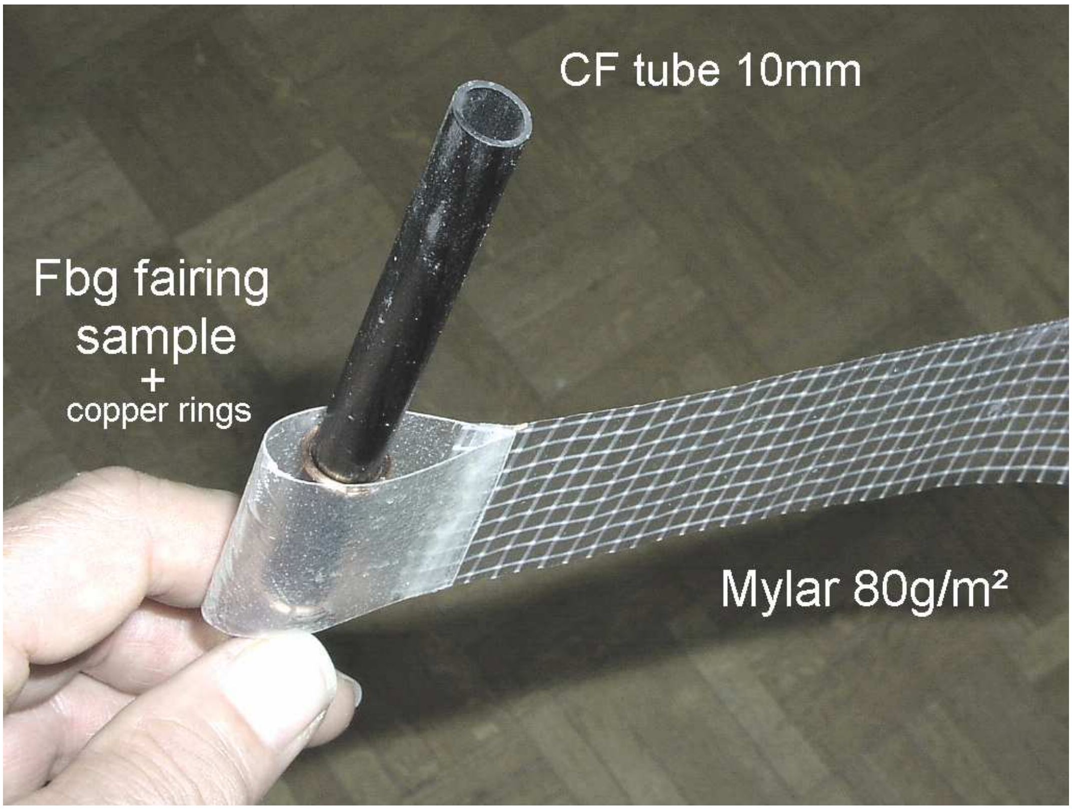
DIY

Lead Roll 1.2mm thicknesss

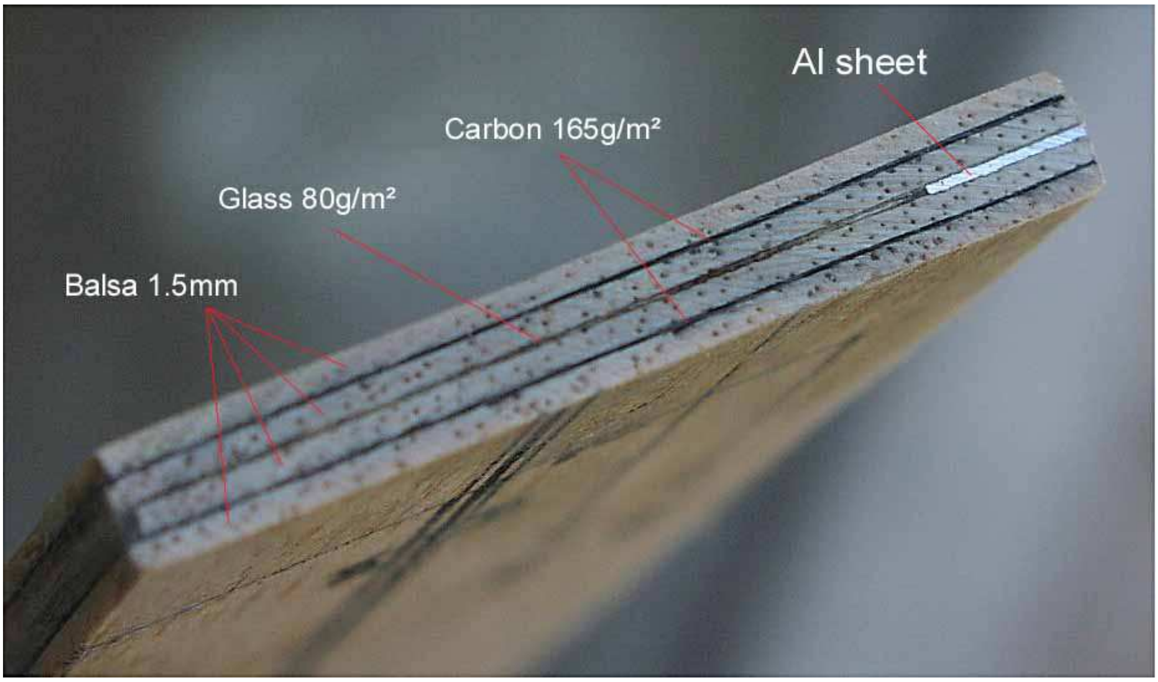
Micro – Freccia with rudder gear

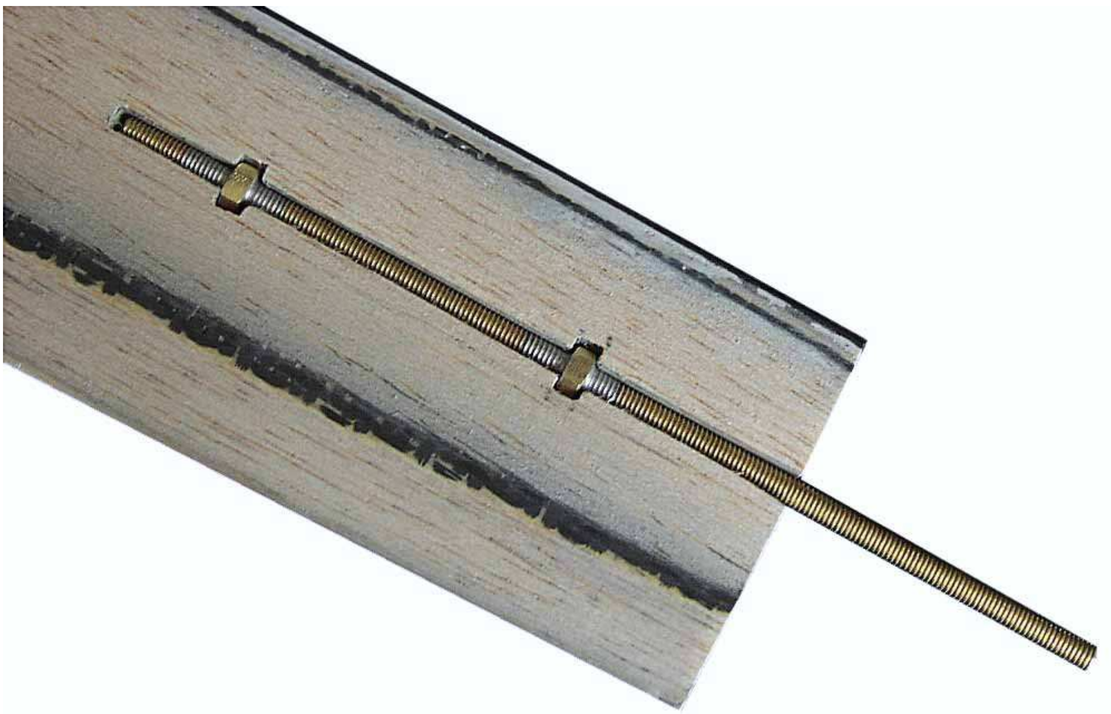
Experimental work

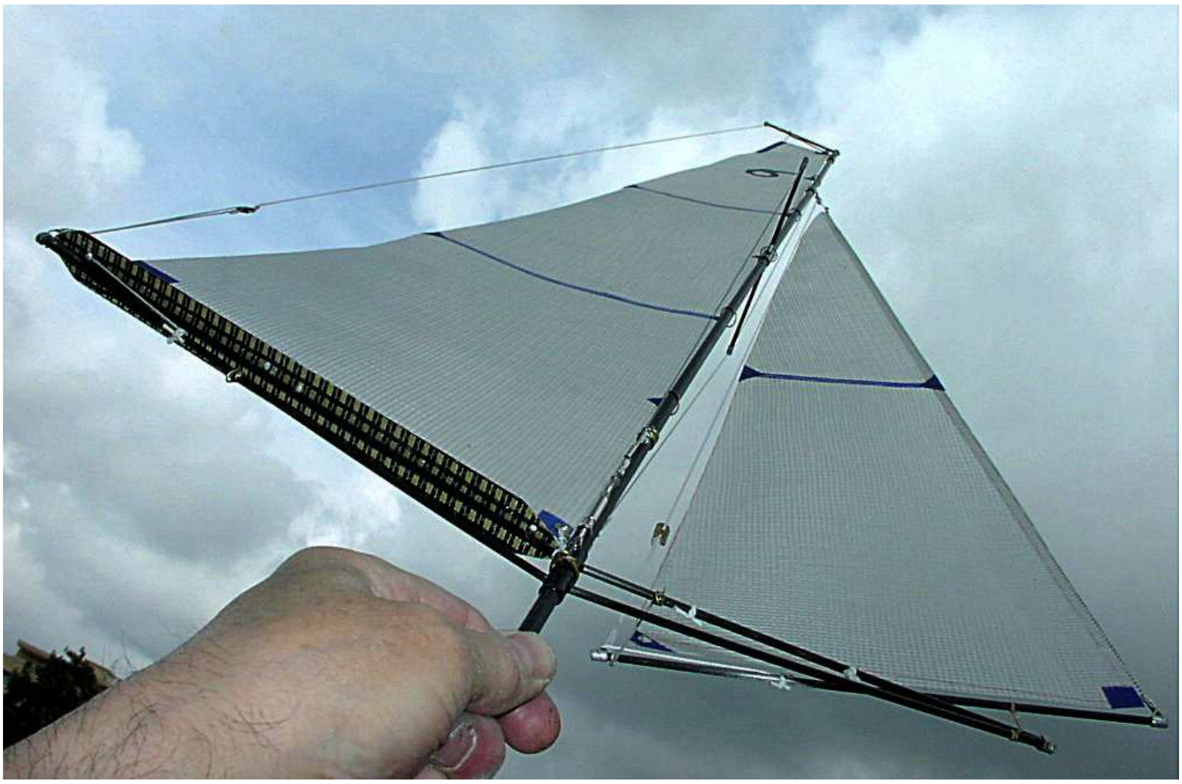




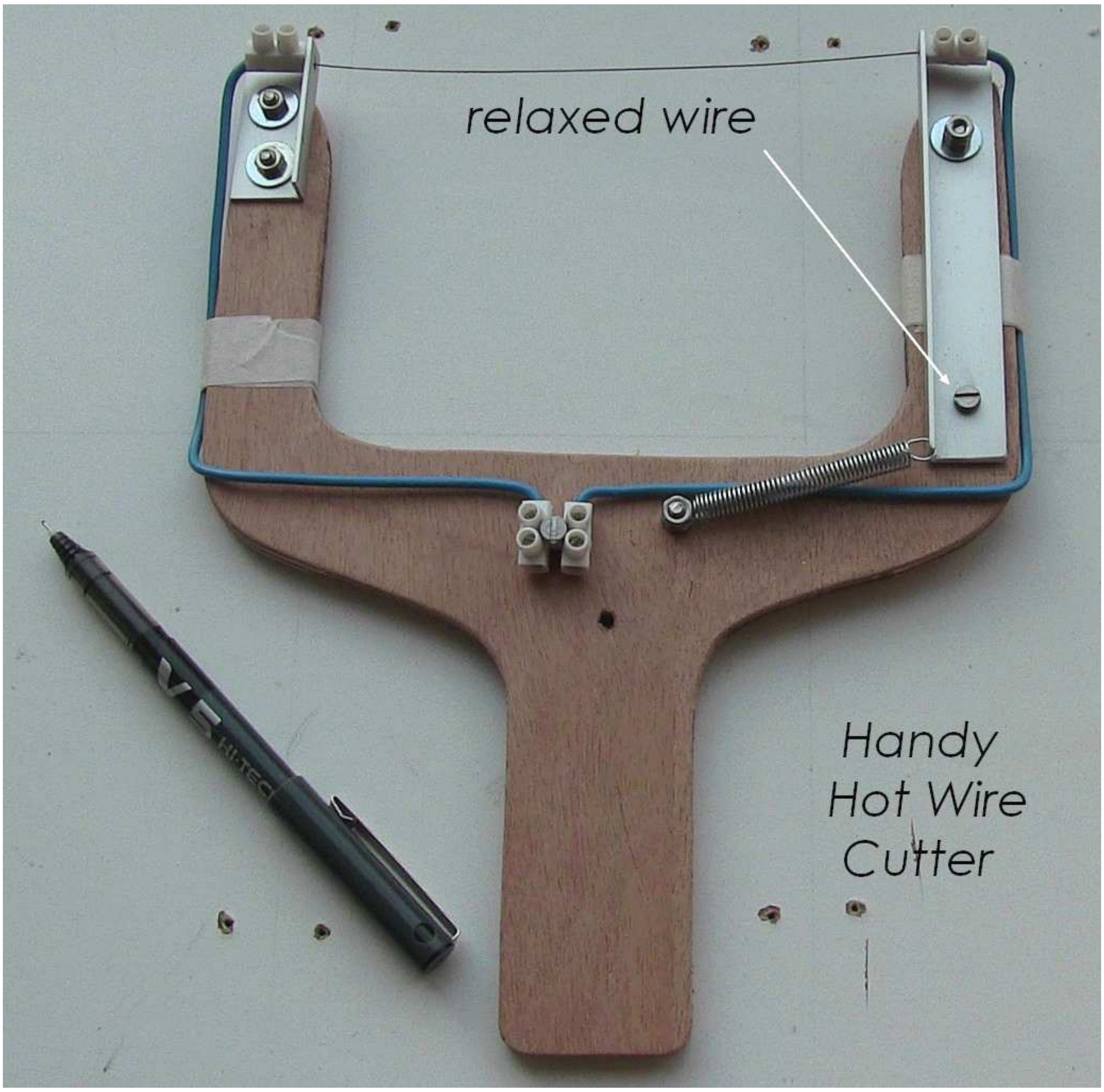
Personal trick
All my Fin use a tiny aluminum stripe to reinforce the trailing edge



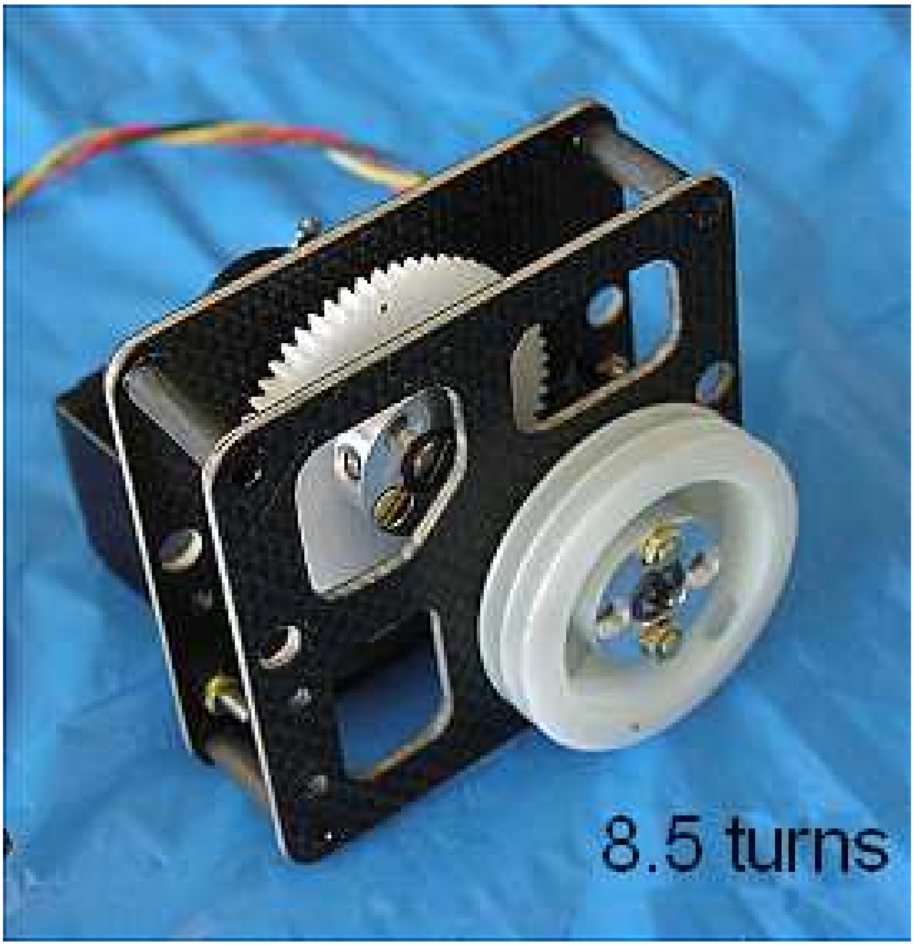


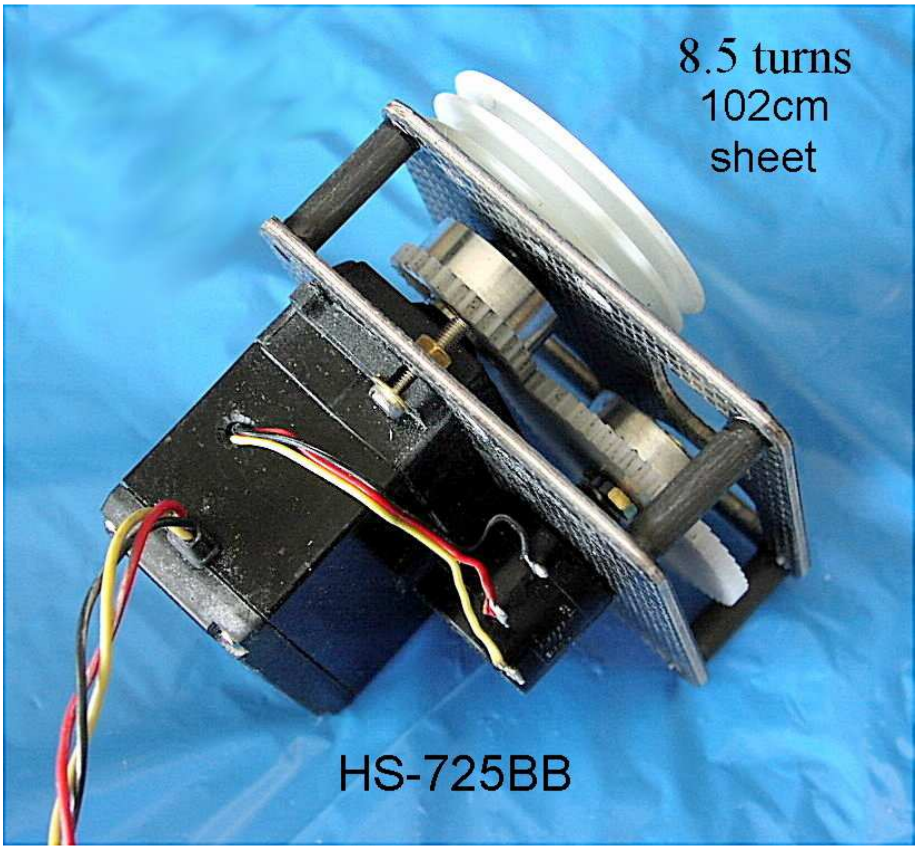


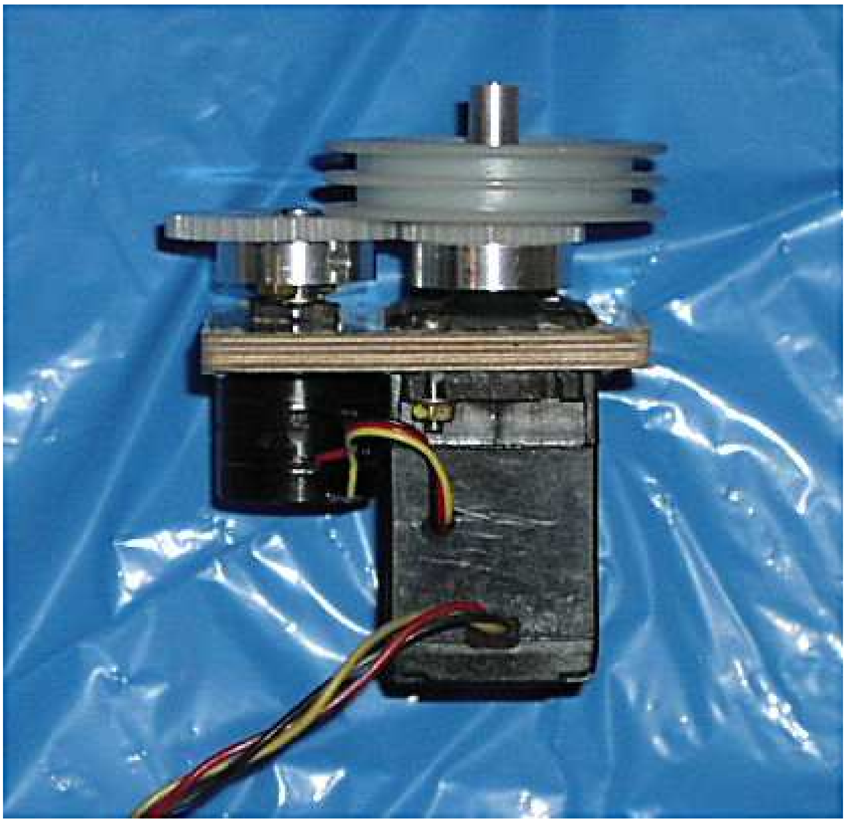
Note the Main boom !


relaxed wire
Handy
Hot Wire
Cutter

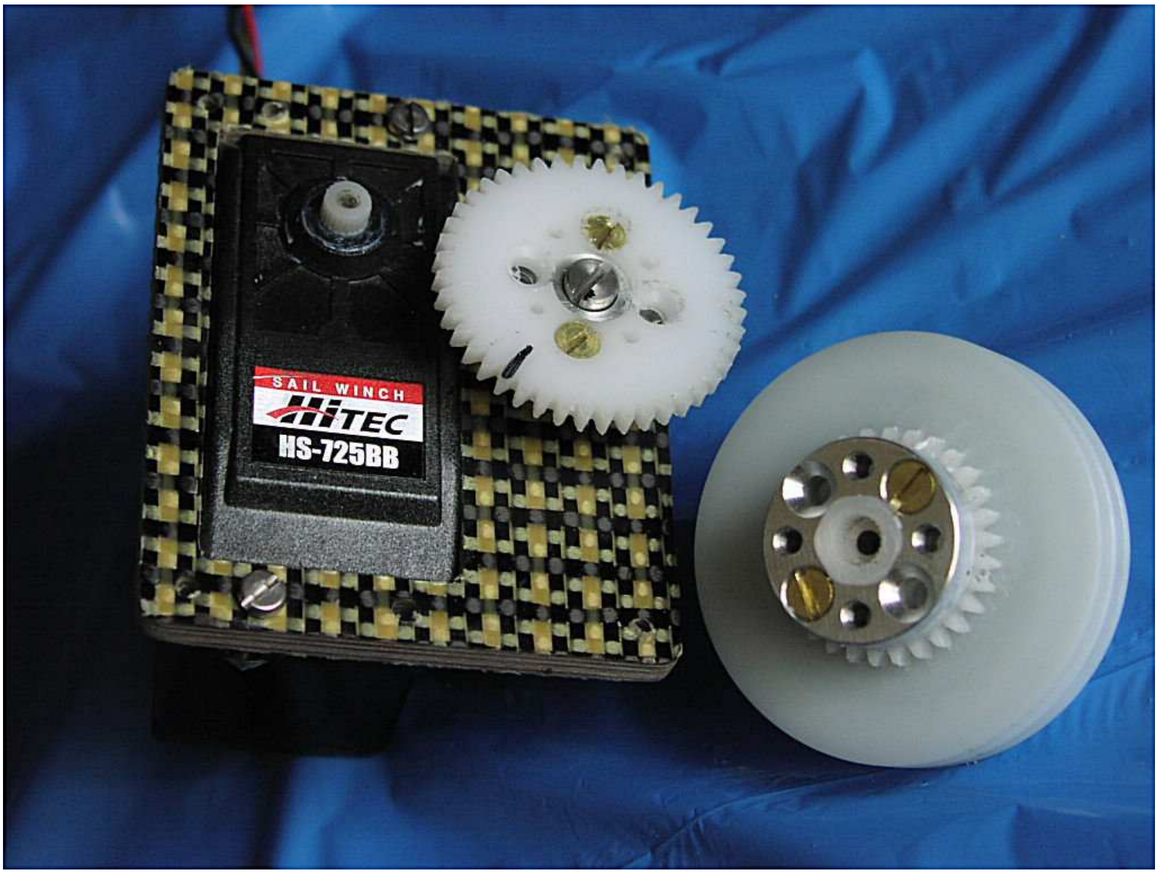
Modified Servos

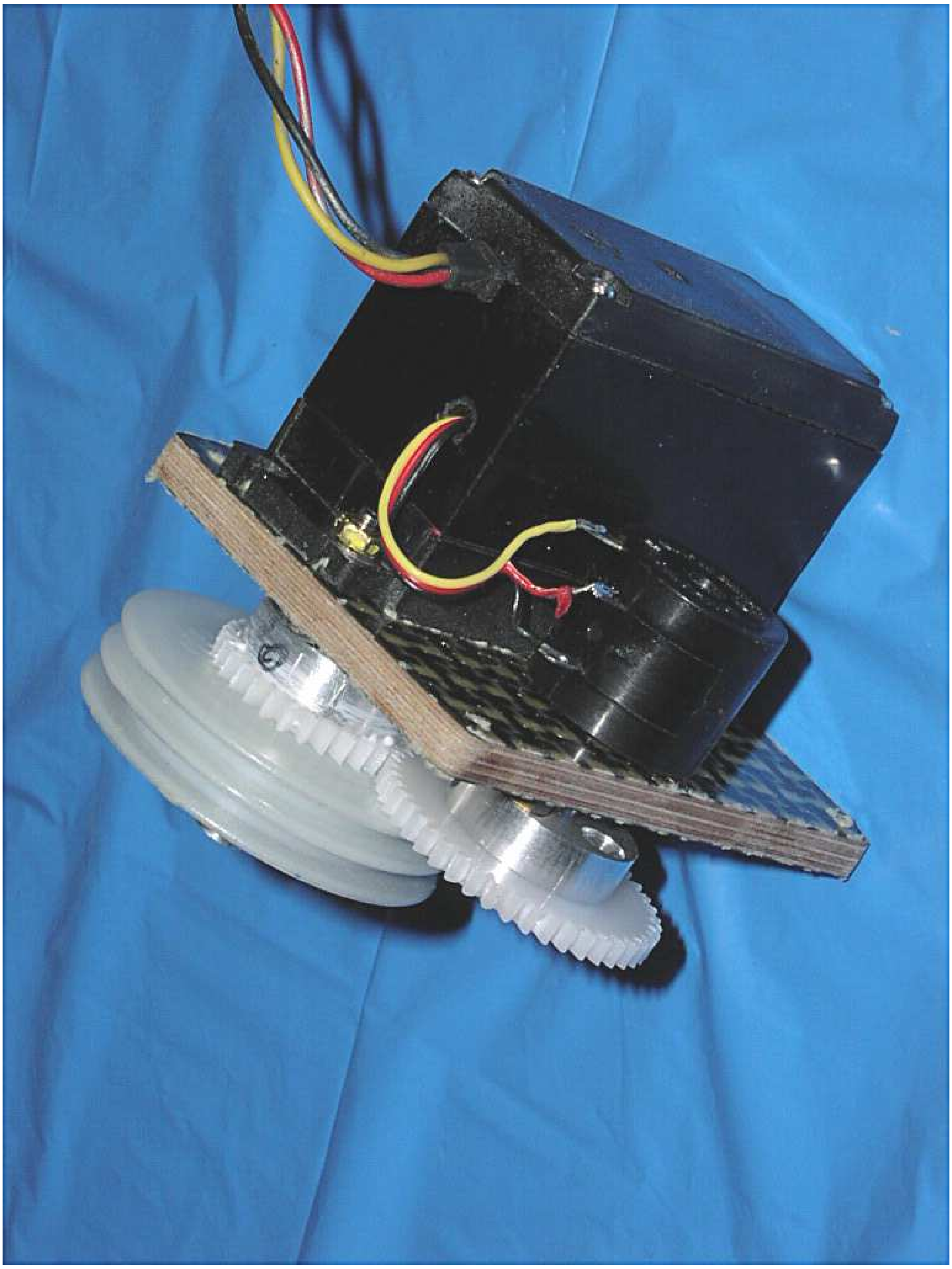

8.5 turns


8.5 turns
102cm
sheet
HS-725BB




HITEC
HS-725BB


SAIL WINCH
HITEC
HS-725BB



Claudio D

ADDENDUM

Making a Model

Let say that I'm not familiar with the 3D software, although I used Rhino 4 just for a simple image.
I like more drawing with 2D software since I have the impression to be free from any "algorithm".
The lines and curves are obeying to my will.
The design will be my creature and not something else!

Was not the first time that someone went in contact with me asking if I could draw a Sailing Model for him?

Not surprised, I told him that are many "on-line" shops where you can spend from 150$ to 3800$.

The discussion went on with Questions and Answers.

A. Yes, but too many cheap plastics and other too expensive!
Q. You would like a wooden model?
A. Why not!
Q. Where you like to use your model?
A. Close home there is an inland lake
Q. What about the Wind force and direction?
A. Variable, but never measured.
Q. Do you wish to make it yourself?
A. Yes!
Q. How large is your car trunk?
A. About
Q. My last, do you wish to race?
A. May be with my Club
Q. Are you expert in construction?
A. I do have built some static models

My brief conclusion:

Ok I understand you need probably an "all-around" RC model!
The exchange went on for a while until was more or less clear of what could be the dimension of the RC Model.

The parameters that count

Since numerous years, the Naval Research and famous Architects found a lot of technical data during the development of several Sailing Boats.
There is not so far a Universal Design for sailing boat.
Much depend on the Rules that each Category or Class adopted.
What is retained valid for Real Boats it is not certain that could be used straight forward with the Scaled Models, therefore shall never forgotten that Wind a Sea cannot scaled down and in this respect the Sailing Model is navigating most of the time in Fresh Air and Waves.
It is also mention that Architects use often scale model in tank testing in order to check the parameters, the resistance being the most important.
Today the Computer Programs are offering a wider choice of parameters.

This is what I generally consider important for my designs independently from the Model size:

The LOA - Length Over-All
The LWL - Length of Water Line
The Beam - at Deck level
The Beam - at Water level
The COA - Curve of Area
The DISP - Displacement
The PC - Prismatic Coefficient
The LCB - Longitudinal Centre of Buoyancy
The LCF - Longitudinal Centre of Flotation
The CLR - Centre of Lateral Resistance
The CE - Centre of Effort of Sails and Sail Plan
The Draft - the Dept of the Hull and Fin/bulb
The Lead - Distance from LCR and CE
The Beam/LWL Ratio
The Hull/Bulb Weight Ratio

With some precautions, I will use them, knowing that some adjustments will be necessary at the end of the design process and construction, the so called "Tuning Phase".

The Transportation is the first question

Very often I observed that the transportation is the first thing that a potential model owner will check.

Here typical small cars trunk

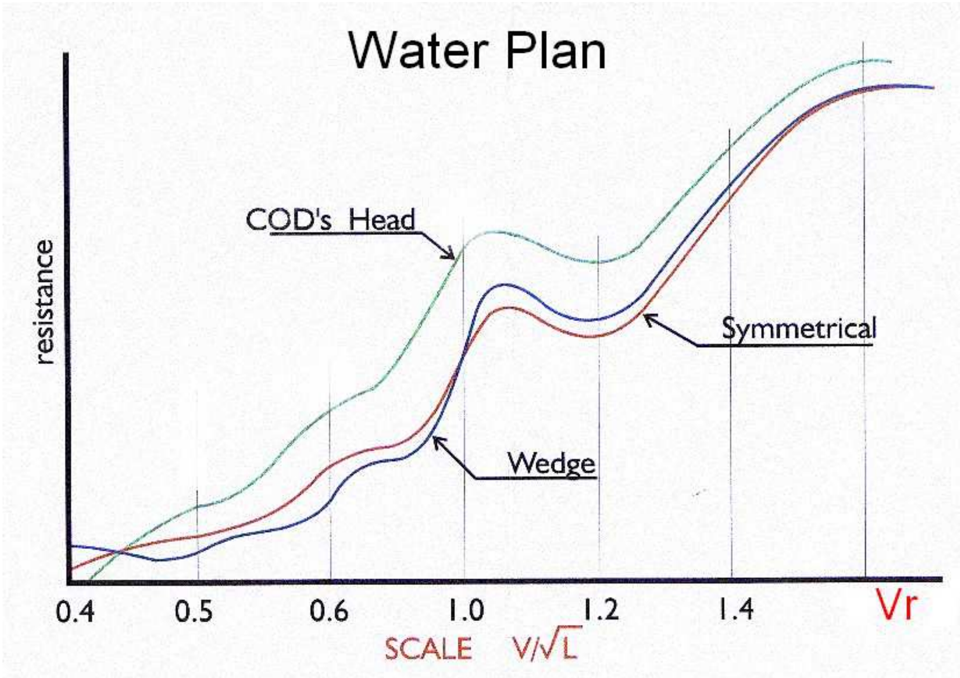
It is probable that a diagonal dimension may allow 110cm hull length.

Other than the Hull there is also the Rig that is, according to my experience, more difficult to store inside the car volume.

I would prefer to use roof bars for the transportation of the Sails Box and why not also the Hull.

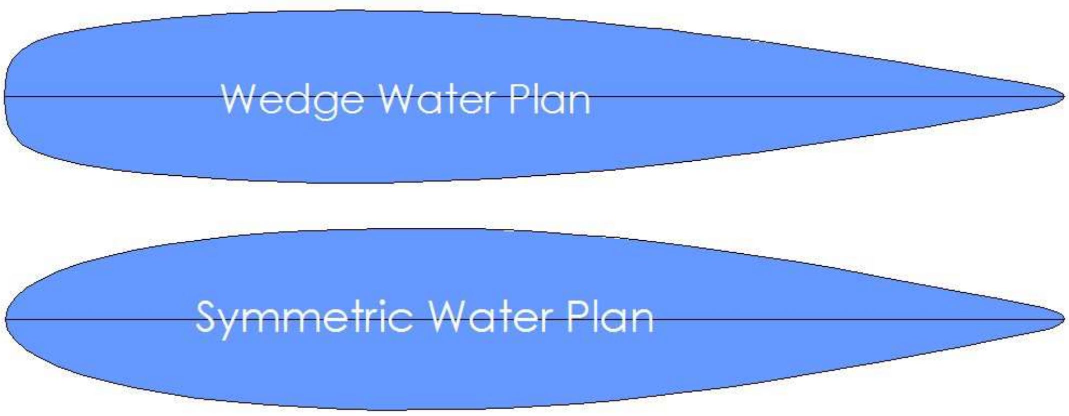
Let thus assume a Model Boat length of 100cm (LWL)

My tool box



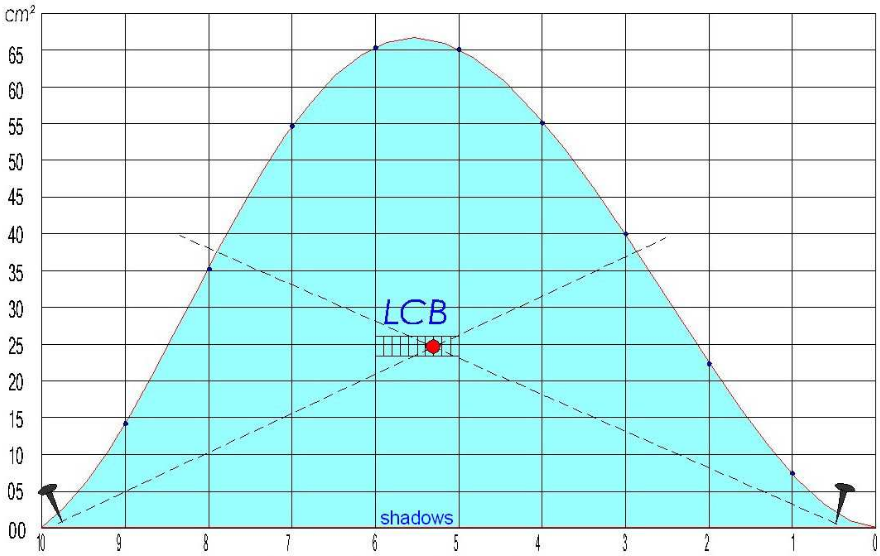
This diagram is collected from Priest and Lewis Book.
Although it is suggested that a mono-hull model should exhibit a relative speed Vr of 1.2, in practice to reach that condition it is necessary a fresh wind and flat water plan, booth conditions being unrealistic when together.

At Vr of 1.0, wedge and symmetrical plans presents similar resistance.



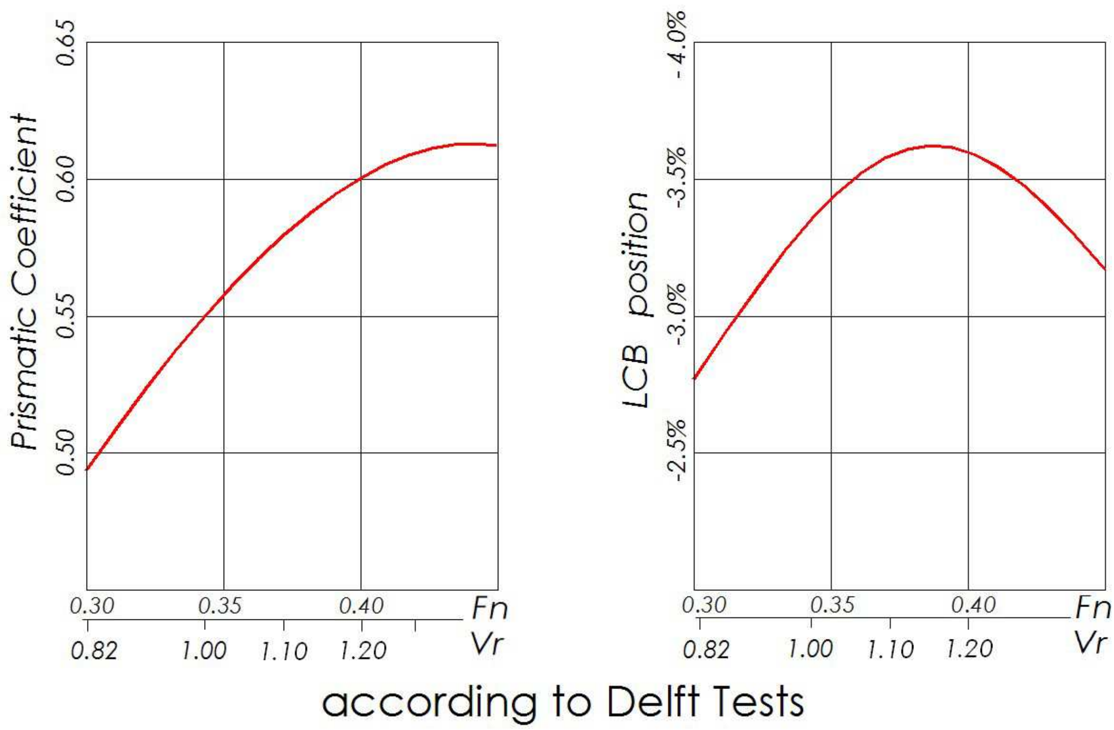
Most of the time RC Sail model has a speed below 0.8 Vr.

Curve of Area - COA



Typical Curve of Areas - COA

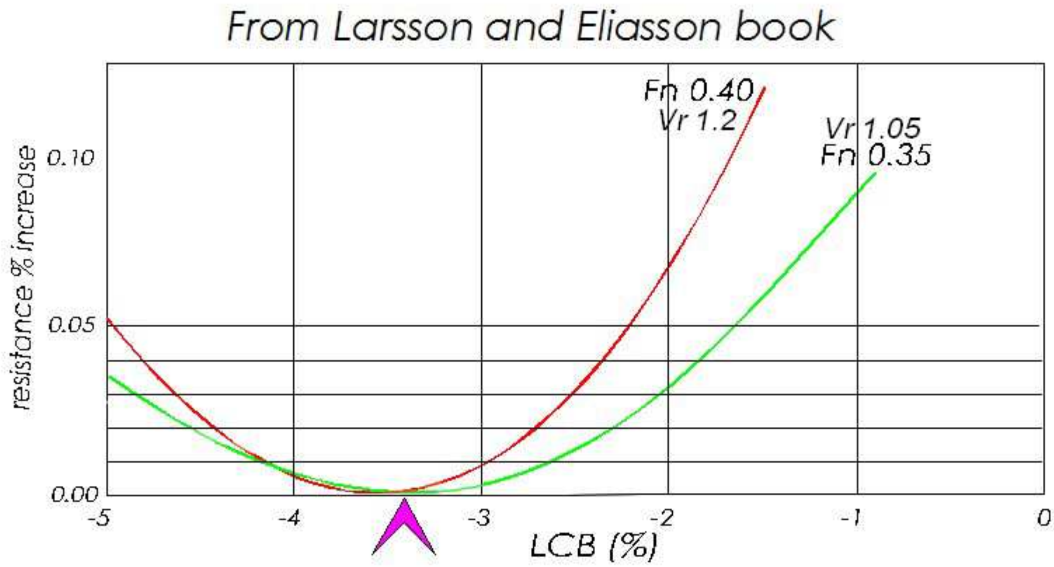
This figure is very important since several data are extracted from like the Hull Displacement (Dspl), the Longitudinal Centre of Buoyancy



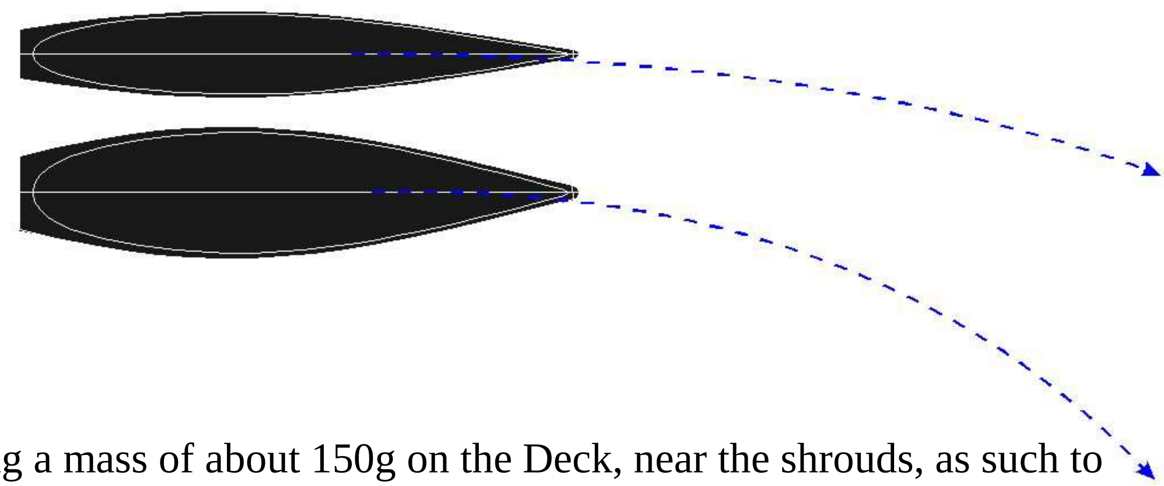
(LCB) and the Prismatic Coefficient (PC).

Prismatic Coefficient may vary from 0.50 rowing hull to 1.0 for a tanker.

Our models are presenting PC between 0.52 to 0.60.
For modern mono-hull designs, it is notorious the LCB should stay around -3.5% of the LWL starting from section 5.
Volvo Ocean Race and Vandée Globe yachts have different approach.

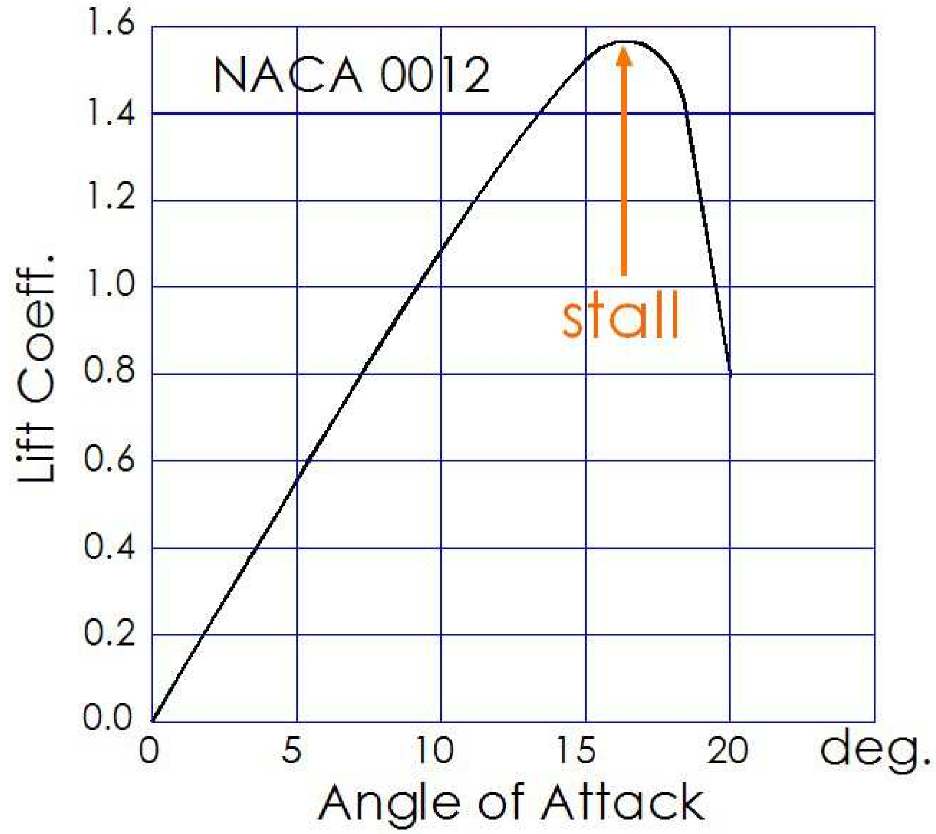


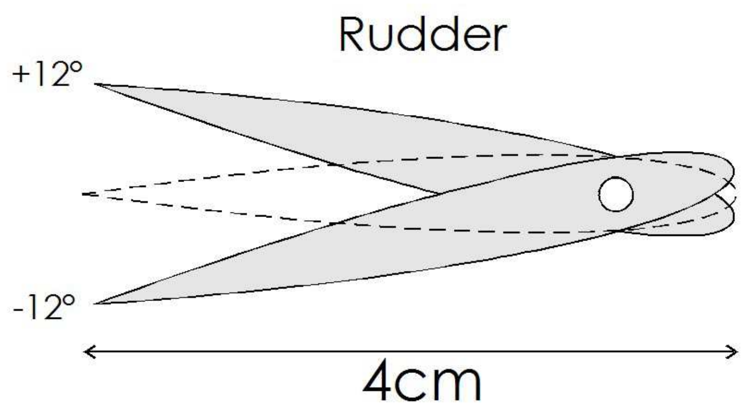
Short consideration about the hull beam:
A wide hull may be offer a better lateral stability but will be suffering longitudinal stability requiring larger rudder angle compensation hence more friction.
Narrow hull will provide better longitudinal stability thus less rudder angle.



Fixing a mass of about 150g on the Deck, near the shrouds, as such to cause a heeling effect of about 15°.
Once in the water push gently the hulls.
The Wide Hull, without appendices, will follow a curved course, while the Narrow Hull, under the same conditions, will follow a

straighter line.
As said before, to recover a straight line with the wide hull it will be necessary to use a larger rudder angle with the risks to reach a "stall" condition.
A NACA 00012 profile may enter into "stall" around 15° of angle of attack





on the paper what represent 12°, it is easy to understand that careful use of "finger" on the joystick is of paramount importance.

Typical rudder swing that is already close to "Stall" condition: Swinging too much is not a good thing and the race can be compromised!

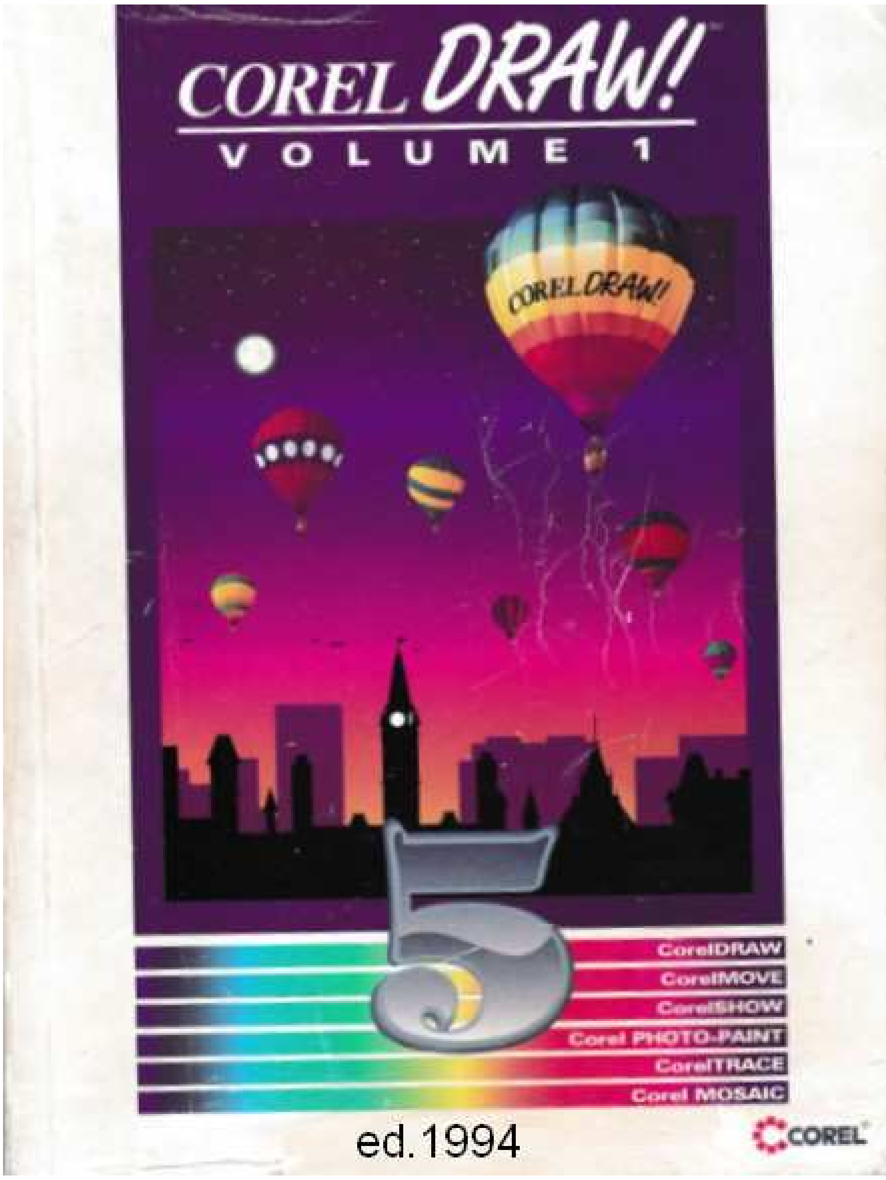
Before entering into the Design subject it is necessary to indicate that my Drawing Software is the CorelDraw 5 of 1994 with the

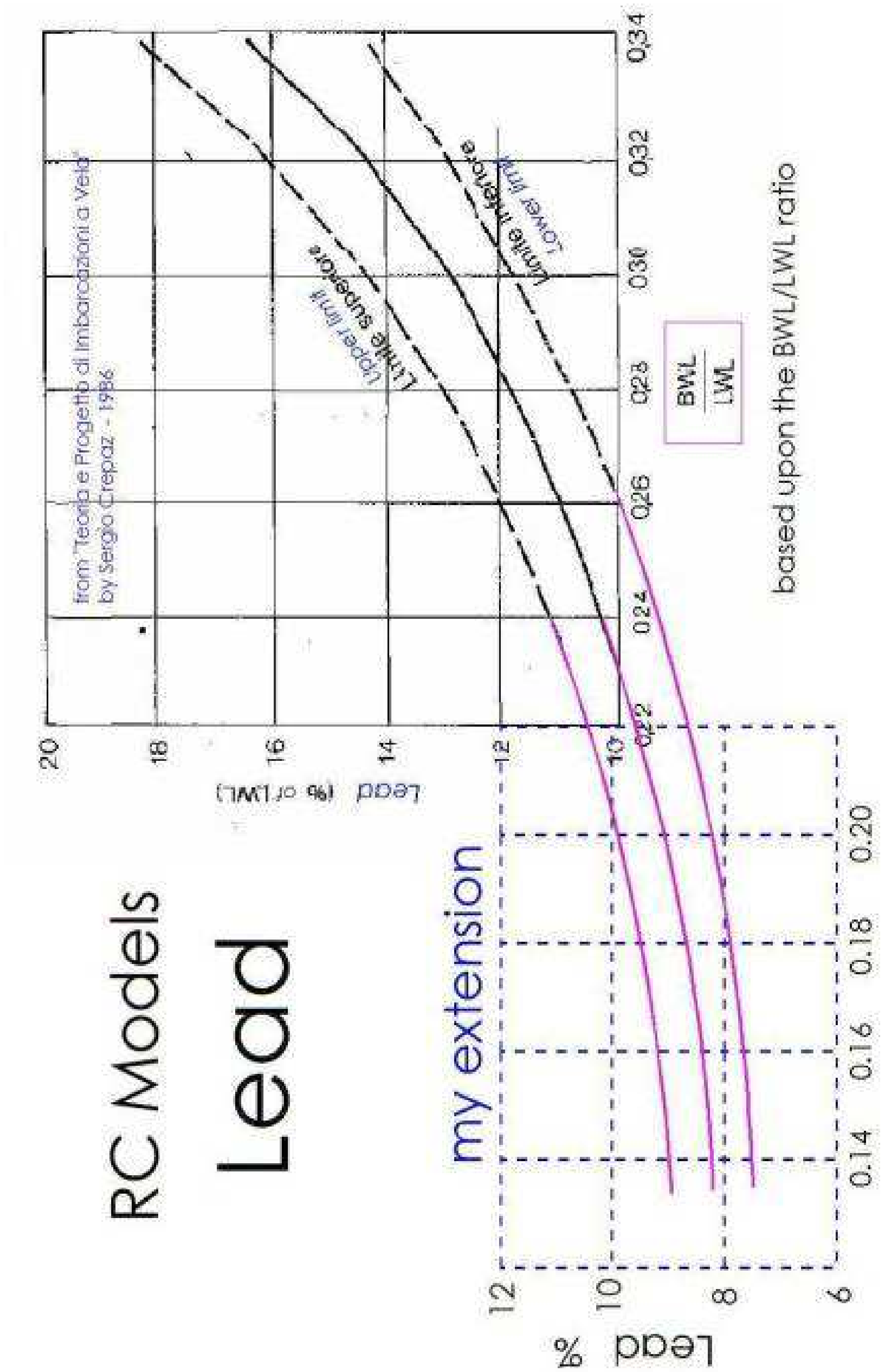
Serial n° DC5-050-087105.

In 1994, I was in Los Angeles at the issue Event. CorelDraw5 is compatible with Windows 3.10 and 32 bits and used so far up to Windows 7.

At the beginning was employed essentially to draw home and house plans.
Today it can be downloaded for free from the Web.

Recent issues are too expensive for the purpose.





This is the graphic extension I have added

for BWL/LWL ratio below 0.22

Comparative data of some RC sail Models from 100 cm to 129 cm

Data	123 Model	AC100/B	Class IOM	Class M	Class AC120	NEW Mod.
LOA	1230mm	1000mm	1000 mm	1290 mm	1200 mm	1145 mm
LWL	1150mm	850mm	1000 mm	1210 mm min	1000 mm max	Free
Beam	173 mm	154 mm	Free	Free	165 mm min	Free
Hull Draft	48 mm	45 mm	60 mm	Free	Free	Free
Deept	480 mm	450 mm	420 mm *	660mm max	420 mm	500 mm
Append.	456 cm3	316 cm3	360 cm3	460cm3	430cm3	460 cm3
Hull Vol.	3670 g	2500 g	3640 g	Free	4070 g	3390 g
DSPL	4226 g	2816 g	4000 g	Free	4500 g min	3850 g min
Mast	1735 mm	1500 mm	1600 mm	2160 mm	1750 mm	1800 mm
Sail Area	7600 cm^2	5200 cm^2	6000 cm^2 **	7200 cm^2 ***	8000 cm^2	7300 cm^2
Main Top	160 mm	80 mm	20 mm	20/40 mm	60-200 mm	160 mm
Bulb	2.95 kg	1.76 kg	2.4 kg	na	2.9 kg	2.65 kg max
Fin Keel	na	na	2.5 kg max	na	3.0 kg max	na
Construction	1180 g	1050g	2000 g	~1500 g	~1500 g	~1200 g ****

OVERALL RATIOS

Bulb Ratio	71 %	61.5%	60%	na	64%	>73%
SA / DSPL	1.81	25.7	1.55	na	1.77	1.81
Fin x Bulb R.A.	141.6 kg/cm	78.7kg/cm	100.8 kg/cm	na	129 kg/cm	132 kg/cm

* From Water Line
** Expected according to IOM Rules
*** 0.5161 m^2 as per Class Rules - Real Surface ~ 7200 cm^2
**** New Servos & Battery technology allow lighter construction

I have compiled a table containing the major parameters of some RC Sailing Models

Design approach

Under this Sky most of the time one should look around a see what exist already and what can be done.
The AMYA expose in the boat list with 39.37" (1000mm) two models: the ODOM weighting 3.34, the Sea Wind weighting 2.94kg and the IOM with 4.0Kg

Bantock sale IOM 2.4kg bulb for

Modern sailing models are exploiting the full hull length to reach highest theoretical speed Vr =1.2.
Practically a Vr of 0.8 will be the most probable and even less!

Let thus assume a model of 1000m of length and a displacement at the buoy of around 3500g that is 500g less than for an IOM.

Some few calculations based upon a provisory Budget.

1000mm budget

Hull	175	35dm² carbon tissue 2x93g/m² + epoxy + 50g/m² glass
Deck	65	12.8dm² carbon tissue 2x93g/m² + epoxy +deck bonding
Hull Reinf.	30	1 x 152g/m² carbon tissue + epoxy
Servos	85	Turnigy Drum /Savox Arm + Savox-SH0255
Battery	70	4x1.5V AA dry lithium 2000Ma
Rx	12	Hitec
Fin	150	Selfmade
Rudder	30	Selfmade
Rig	260	Classic
Trunks	30	Fin - Rudder -
Struts	25	Fin - Jib
Supports	50	carbon square tubes, etc
Hardware	40	fairleads, pulleys, eyebolts,turnbuckles, etc.
Total	1022g	
Rounded at	1050g	
Bulb	2550g	
Boat	3600g	- 390g appendages = Min. Hull DSPL 3600g - 390 = 3210g
ratio	70.8%	

The Table on the preceding page suggests a construction weight of 1050g.

To have a laterally stable boat it is necessary that the ratio between the total weight and the bulb weight be around 70%.

Let try:

Total weight 3600g less 1050g = 2550g for the Bulb therefore the ratio will be: 2550/3600 = 70.8%.

Based upon the principle that the lightest boat will be the faster, all other parameters being similar …

New weight 3500g less 1050g = 2450g left for the bulb thus the ratio will be: 2450/3500= 70%

Since the IOM bulb of 2400g can be bought directly for 75€ …

The new trial will be: 3450g less 1050g = 2400g just as IOM bulb. The ratio will be 2400/3450= 69.5%

At this point the solution consisting in the purchase of the IOM Bulb already available on the marked is the right approach.

It is recalled that the IOM ratio is 60%

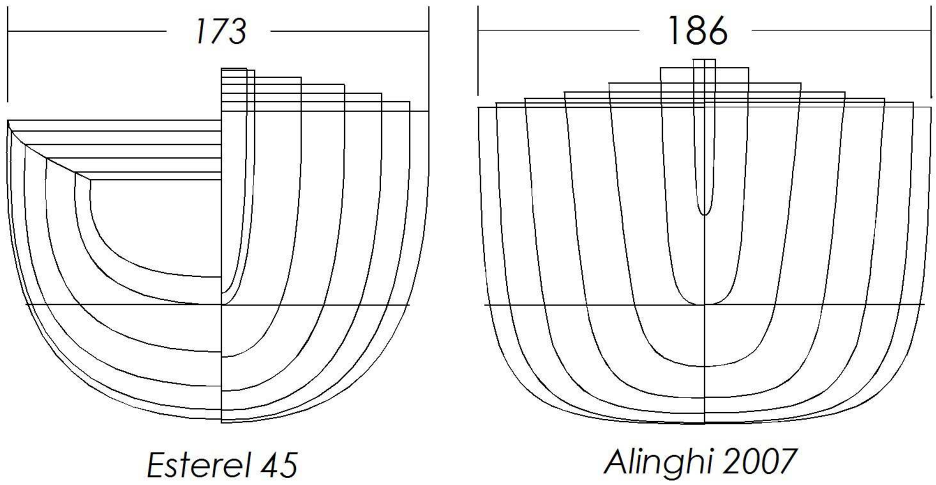
Actually, all efforts shall be made to respect the construction limits of 1050g.

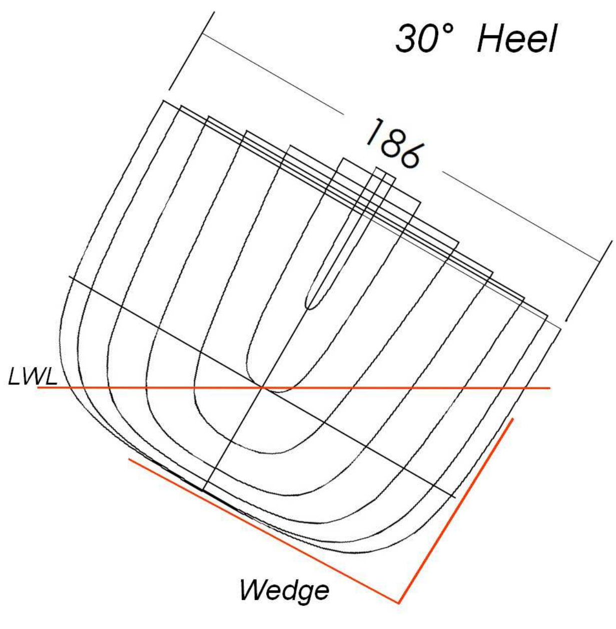
By experience the wooden construction is excluded since the Hull will be too heavy probably in the order of 150g more, will be verified at the end of this analysis!

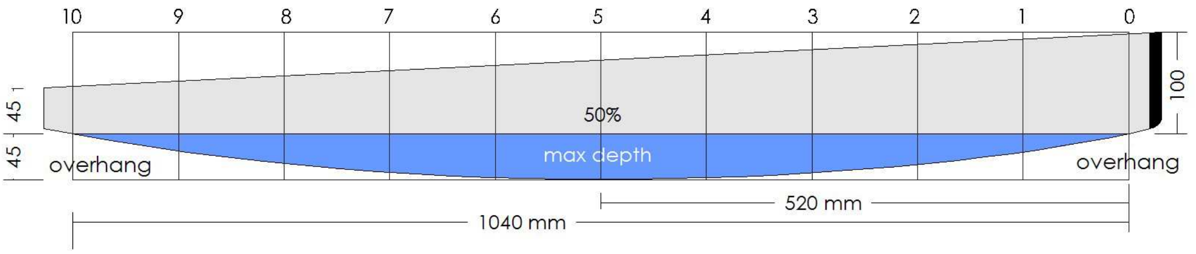
The initial step will be to draw the "model sole" in other words the immersed volume.

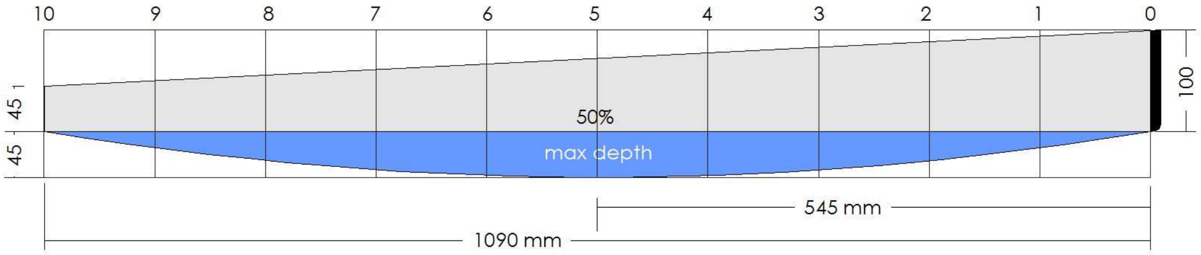
Once drawn the "immersed volume", what will be added above the water plan will follow other criteria including the aesthetic aspects being the only visible part when the boat is in the water.

From hydrodynamic point of view the round hull (arc of circle) will present the lowest Wet Area hence producing less friction.
This principle shall be considered from the beginning, although the America Cup yachts seen in 2007 were rather different presenting hulls almost square, (see Alinghi, the winner).
The reasons are unknown by the author, but probably due to a better course stability when the Hull lower edge is immersed at 25° of heel.









With the above examples, the top one has shorter Water length and small overhangs, the second the LWL is as long as the total length of 1000mm

So we have chosen the max displacement of **3450g** while the Prismatic Coefficient can be recover from the page 5.

For an **"all-round"** model, the PC could be **0.57/0.58**

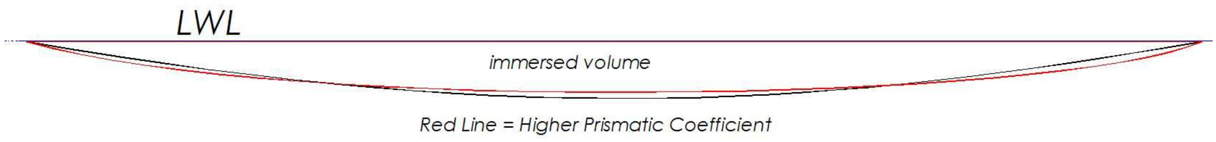
Under this condition the Main shadow immersed surface Area can be calculated according to this formula:

Main Area = DSPL – App / 0.57 x 100cm

3450 – 390 / 57 = 53.68 cm^2
or
3450 – 390 / 58 = 52.75 cm^2

Remember that **1050g** are employed for the Model construction

As observed, with the higher PC the Main Surface is reduced since the volume will be spread along the hull extremes.



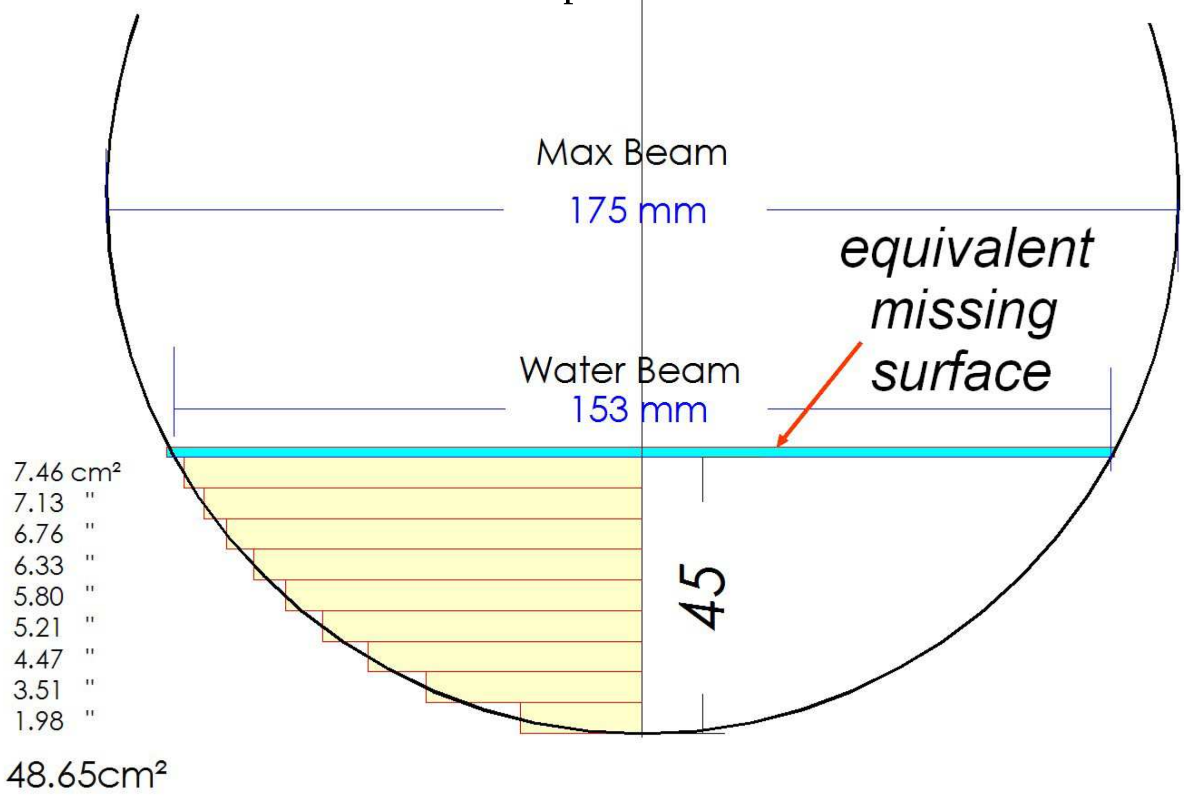
Checking the Section Surface

Until now the boat beam was not mentioned as well the draught. The previous table at page 9 one could decide to use 175mm for the Deck beam and 45mm for the draught

Let start with an Arc of Circle:

still missing some cm²

Based upon Shadow n° 5

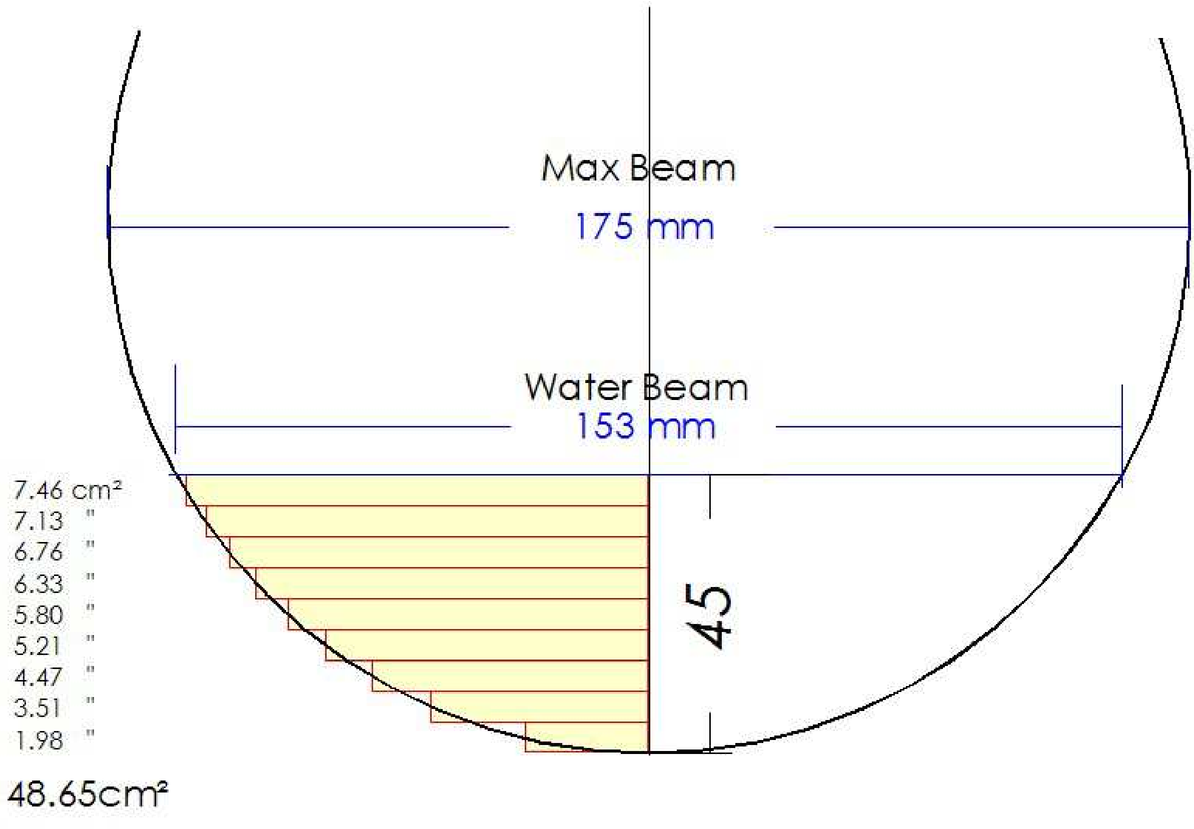


At this point 3 options can be considered:

1. Increase the draught at 46.7mm.
2. Modify the Arc of Circle curvature.
3. Widen the Beam.

- Increasing the draught is not a good solution since is the source of a deeper wave that add friction.
- The Arc of Circle can be slightly modified.
- Wider beam acceptable with lighter modification of Arc

Of course a "square option" is not totally disregarded!



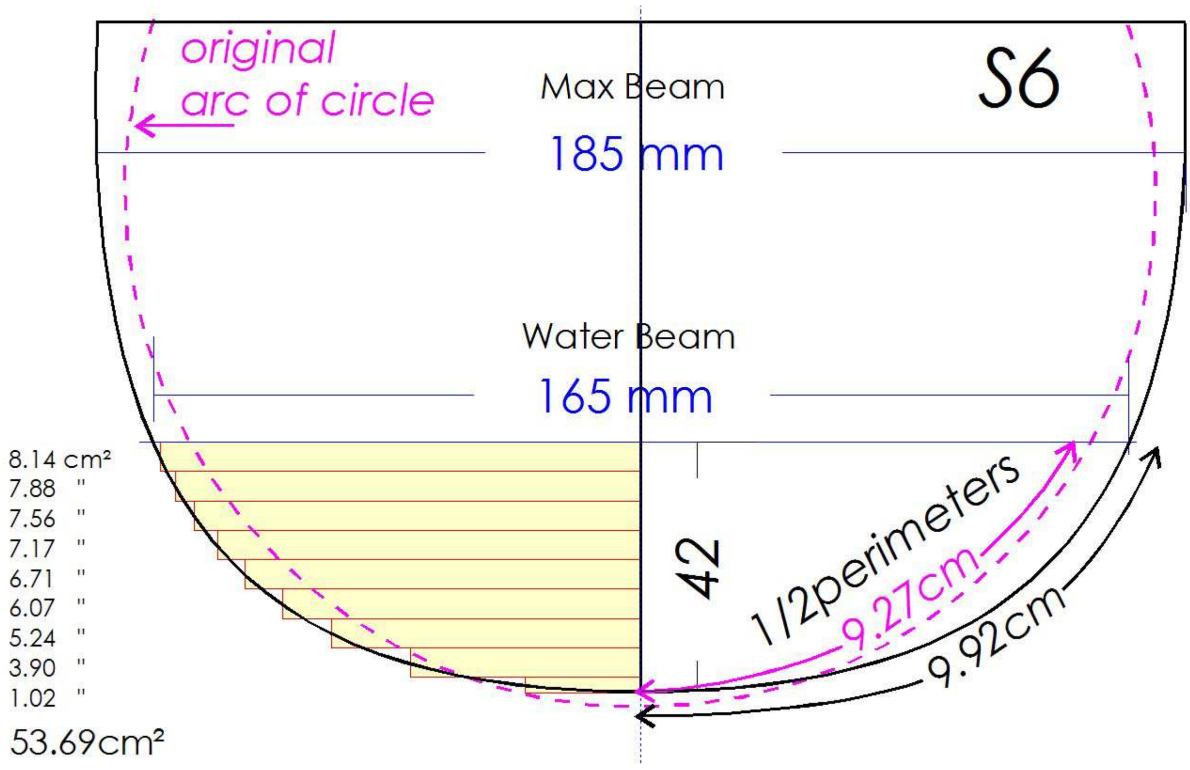
That's it
Thanks to the Spline tool of CorelDraw

Wanted 53.68cm and obtained 53.69cm²

Is not an Arc of Circle but still acceptable.
42mm is the draught of Shadow n°6.
Note the difference of the perimeter lengths

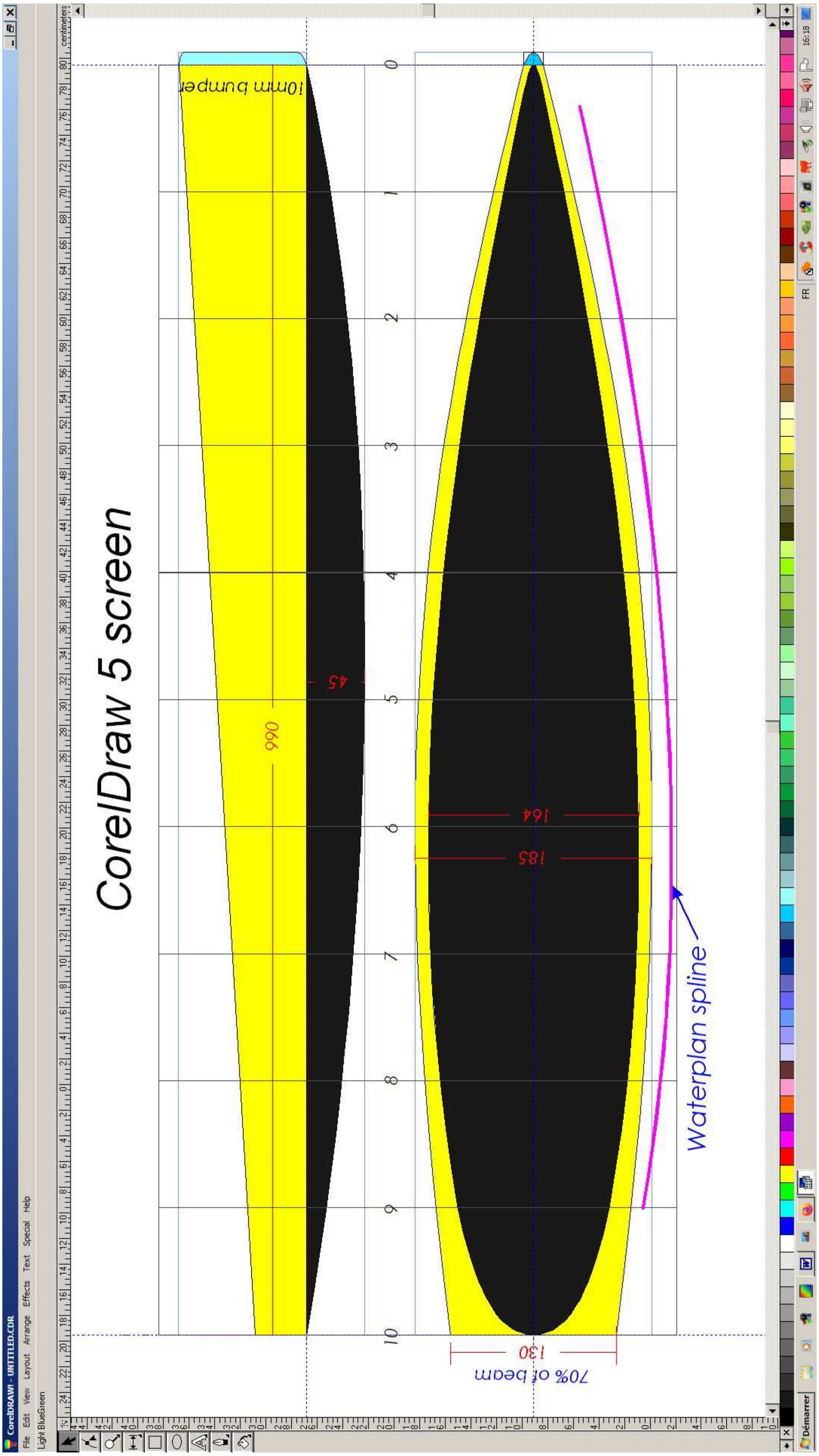
At this point we can draw the model plans with the following parameters:

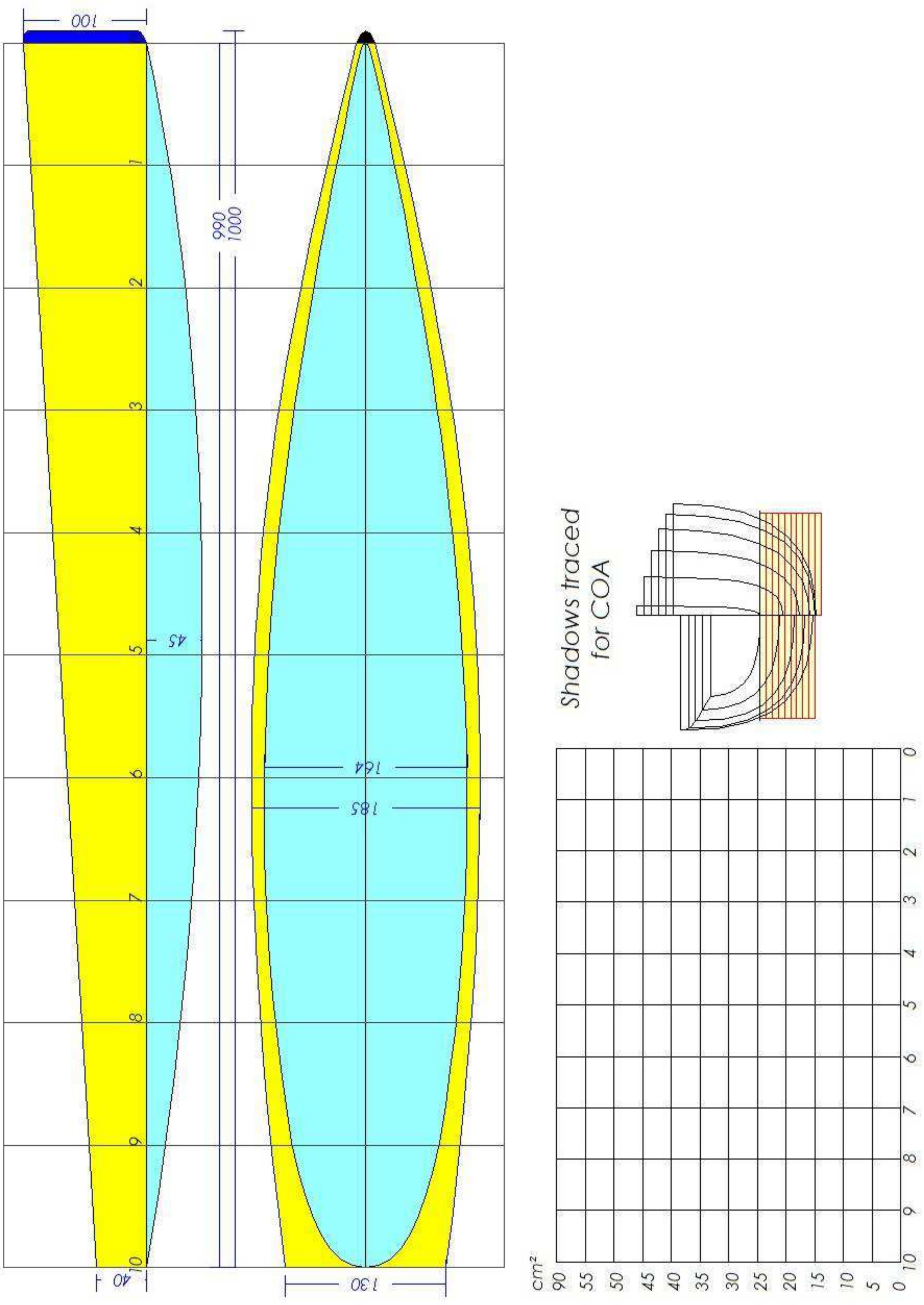
Hull length 1000mm
Water plan length 990mm (elastomeric bumper excluded)
Deck Plan wide 185mm
Water plan wide 164mm
Main draught 46mm



Obviously on that basis some changes can occurs.

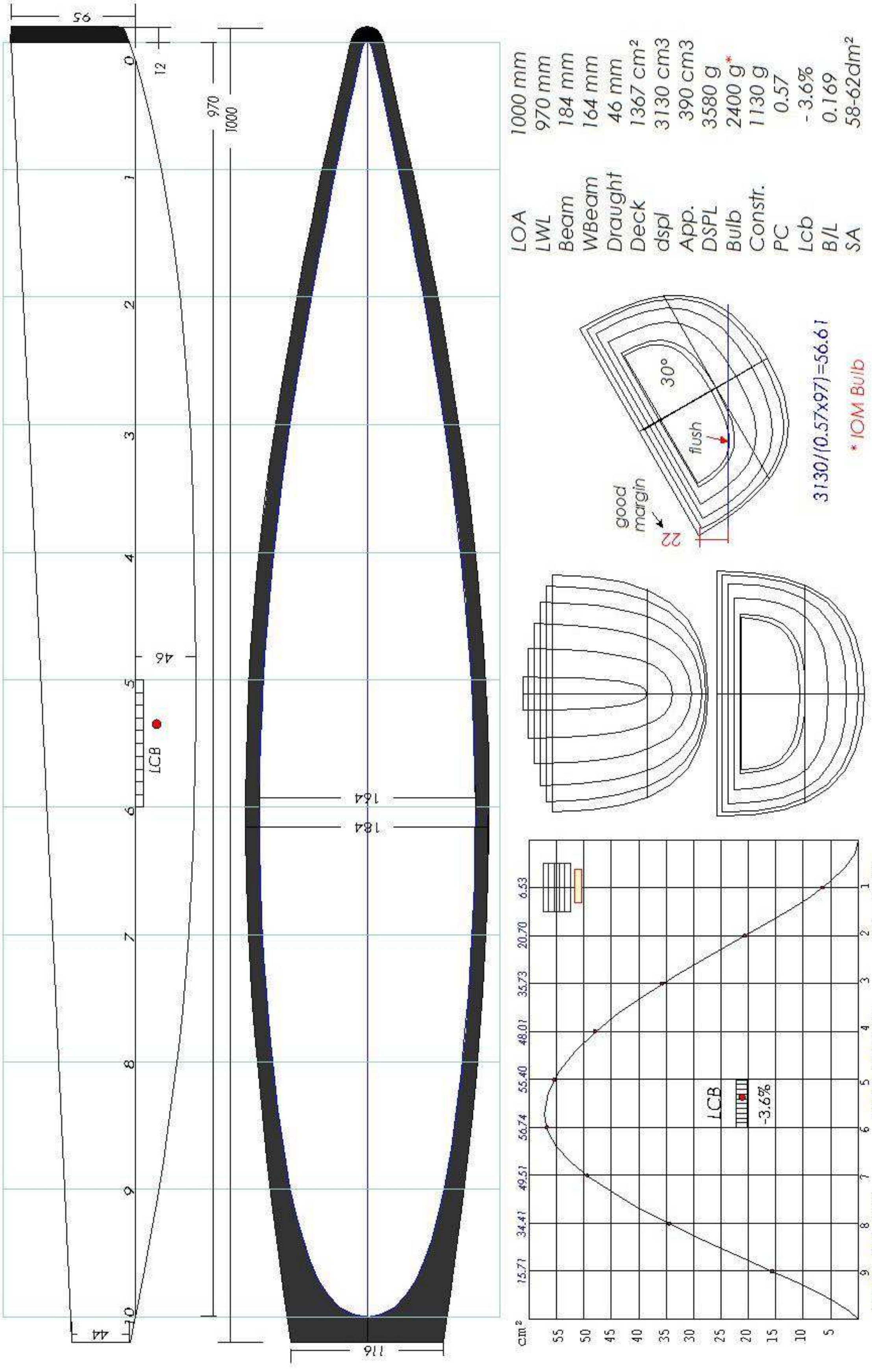
The basic plan depicted next page with CorelDraw screenshot


CorelDraw 5 screen
10mm bumper
990
45
164
185
130
70% of beam
Waterplan spline
0
1
2
3
4
5
6
7
8
9
10

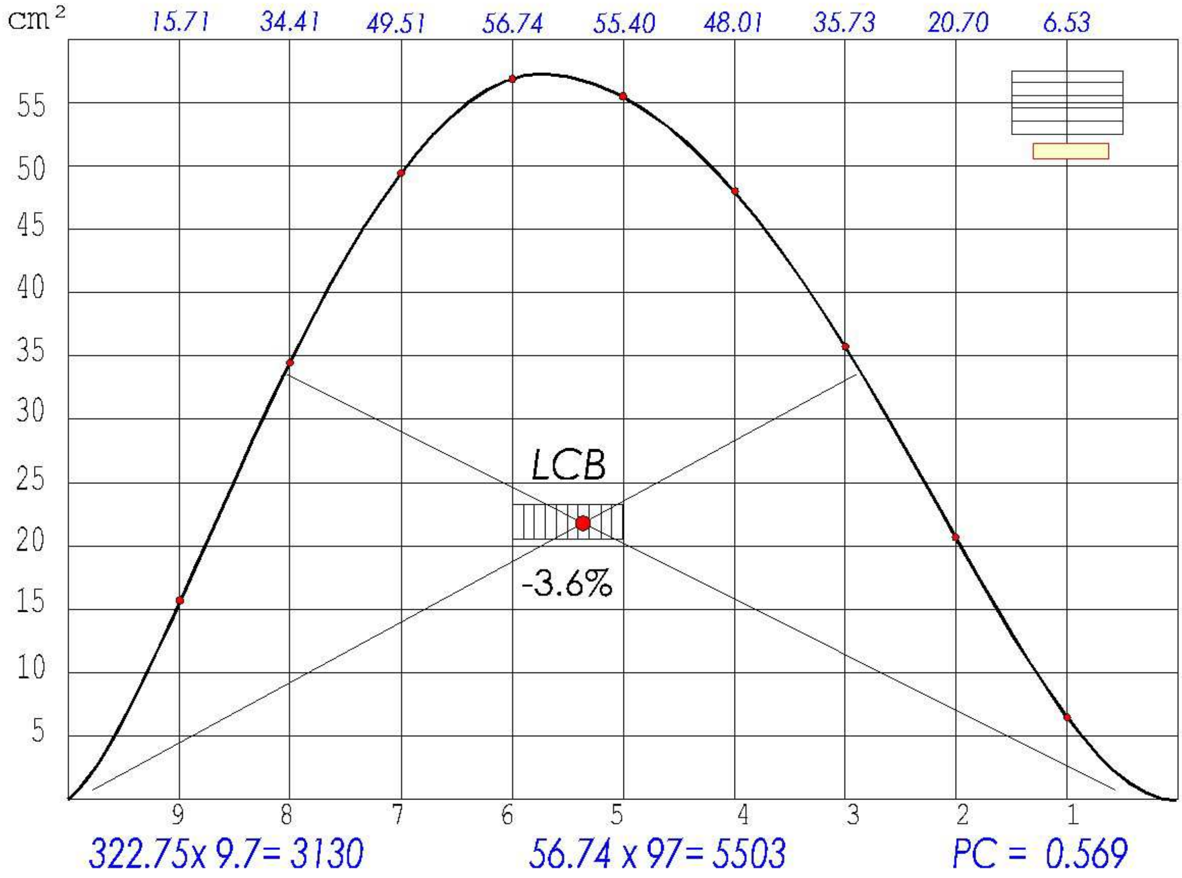


The Plan is traced, next will be the surface calculation of each shadow and reported on the COA Graph.

Definitive design called "1000"



This is the '1000 ' Curve of Areas

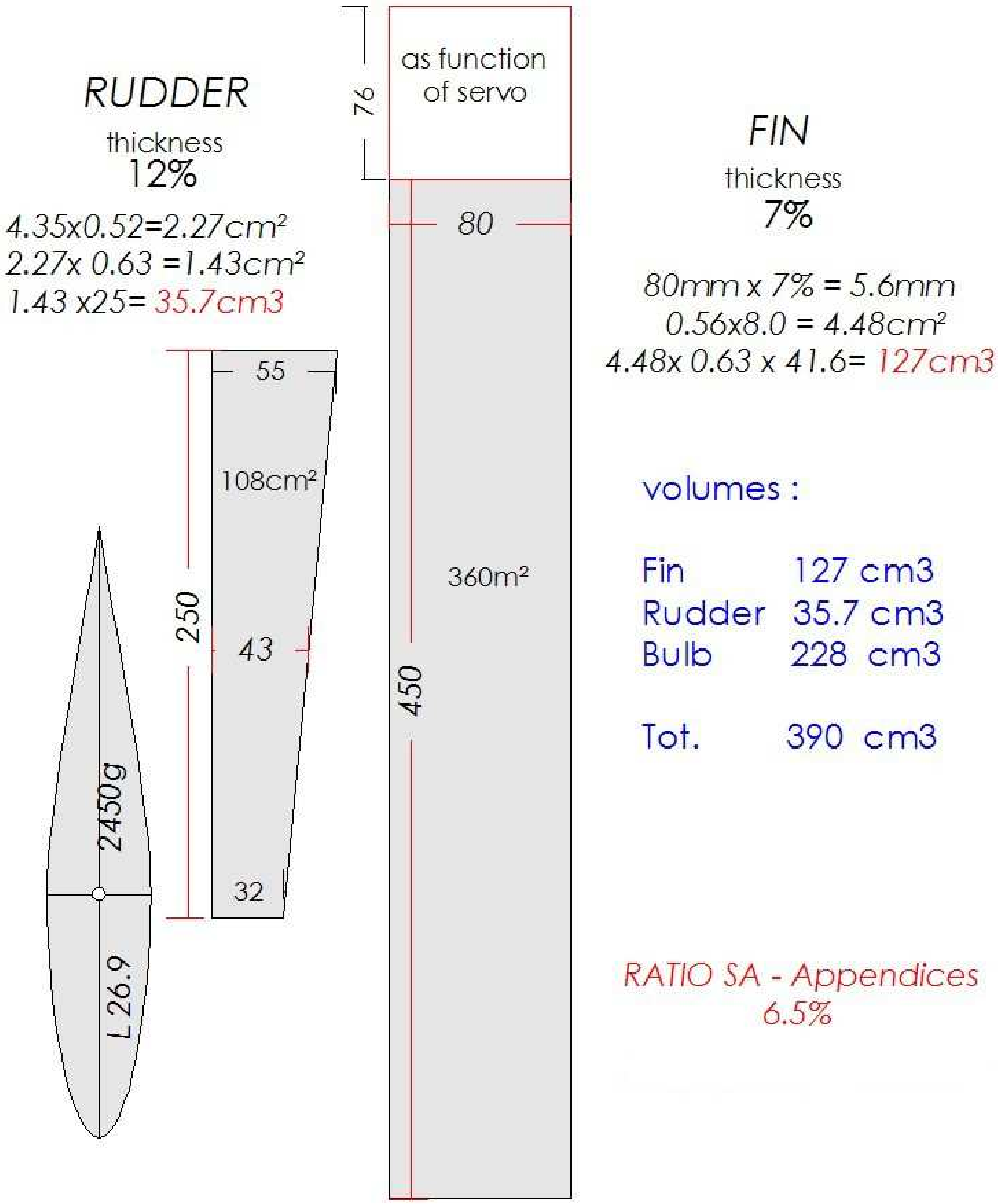


The Hull Displacement of 3130cm3
The Prismatic Coefficient that is close to the Design value of 0.57
The Lateral Center of Buoyancy (Hull CG) that is positioned behind the Shadows n° 5 by 3.6% of LWL equal to -34.9mm

The Full Displacement is obtained by adding the Hull Displacement and Appendices Volume:

3130 cm3 + 390 cm3 = 3520cm3 or g.

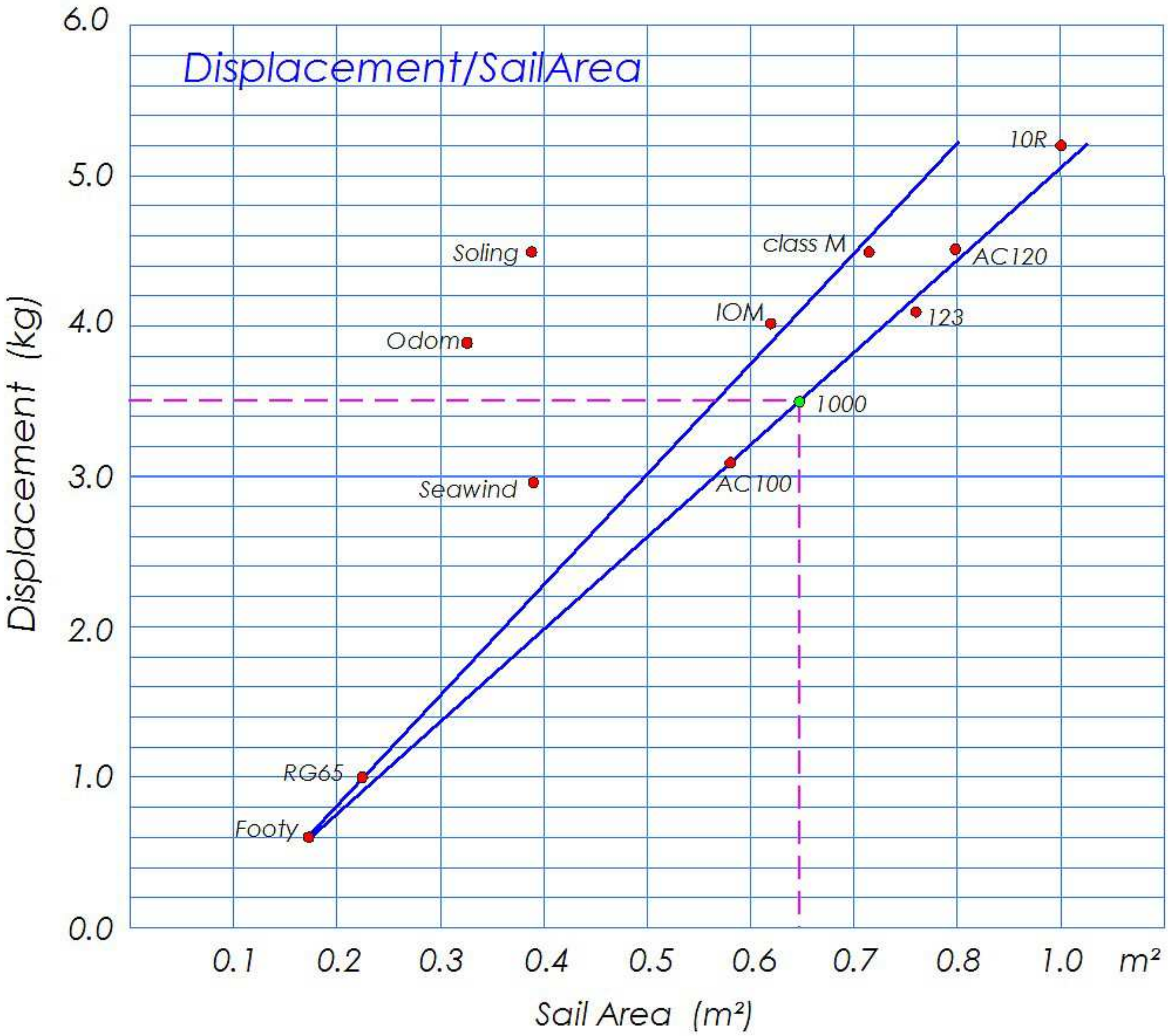
Is a bit higher therefore the model will float higher on the water since the Budget foresees a displacement of 3450g, thus 70g less, unless the construction will come out a bit heavier!



The Appendices

This graphic show the Displacement –Sail Area
of known RC Models.

IOM and Class M are on the conservative side
while modern design adopts larger Sail Surface

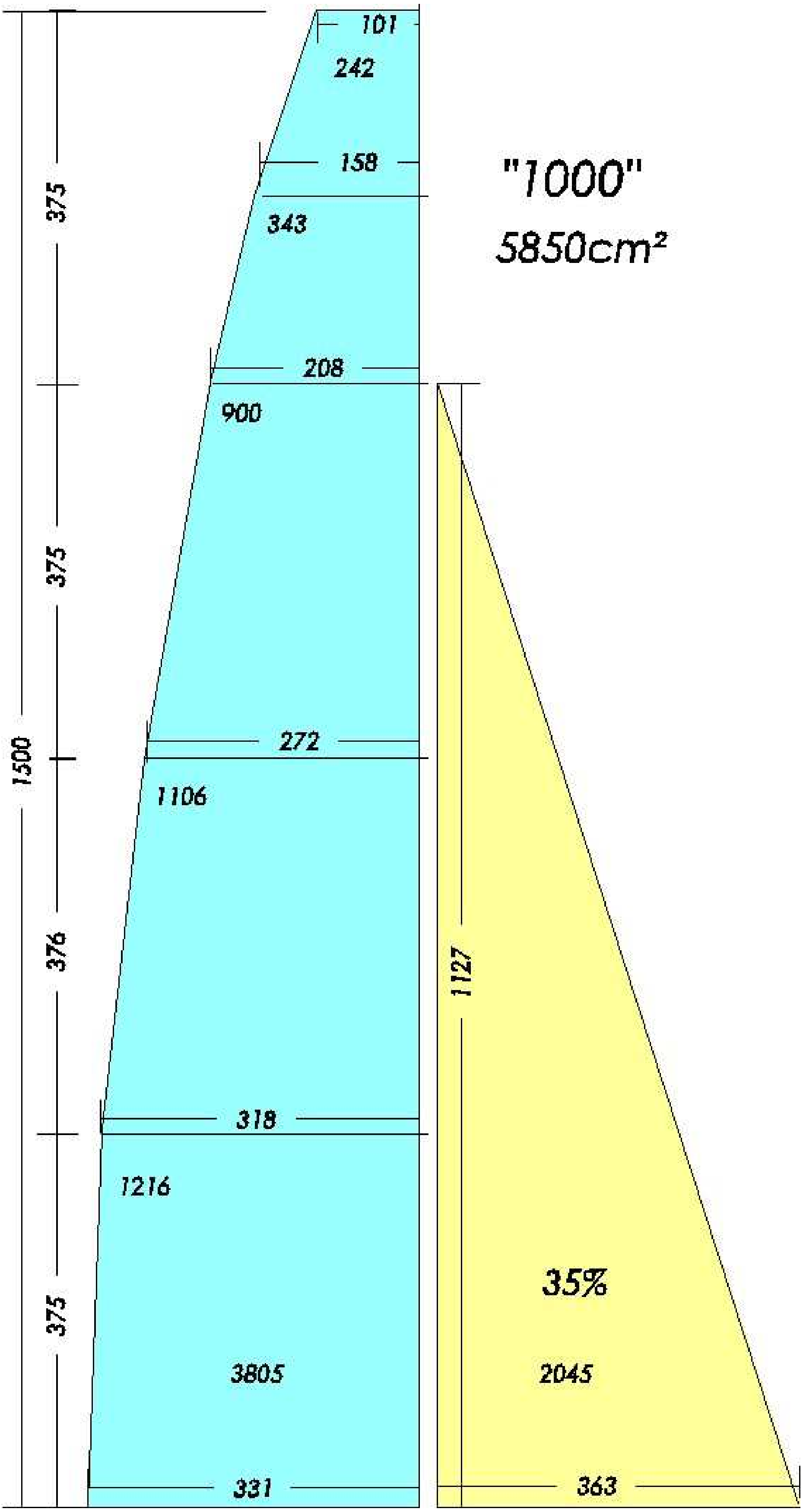


I have collected the Data from various projects.

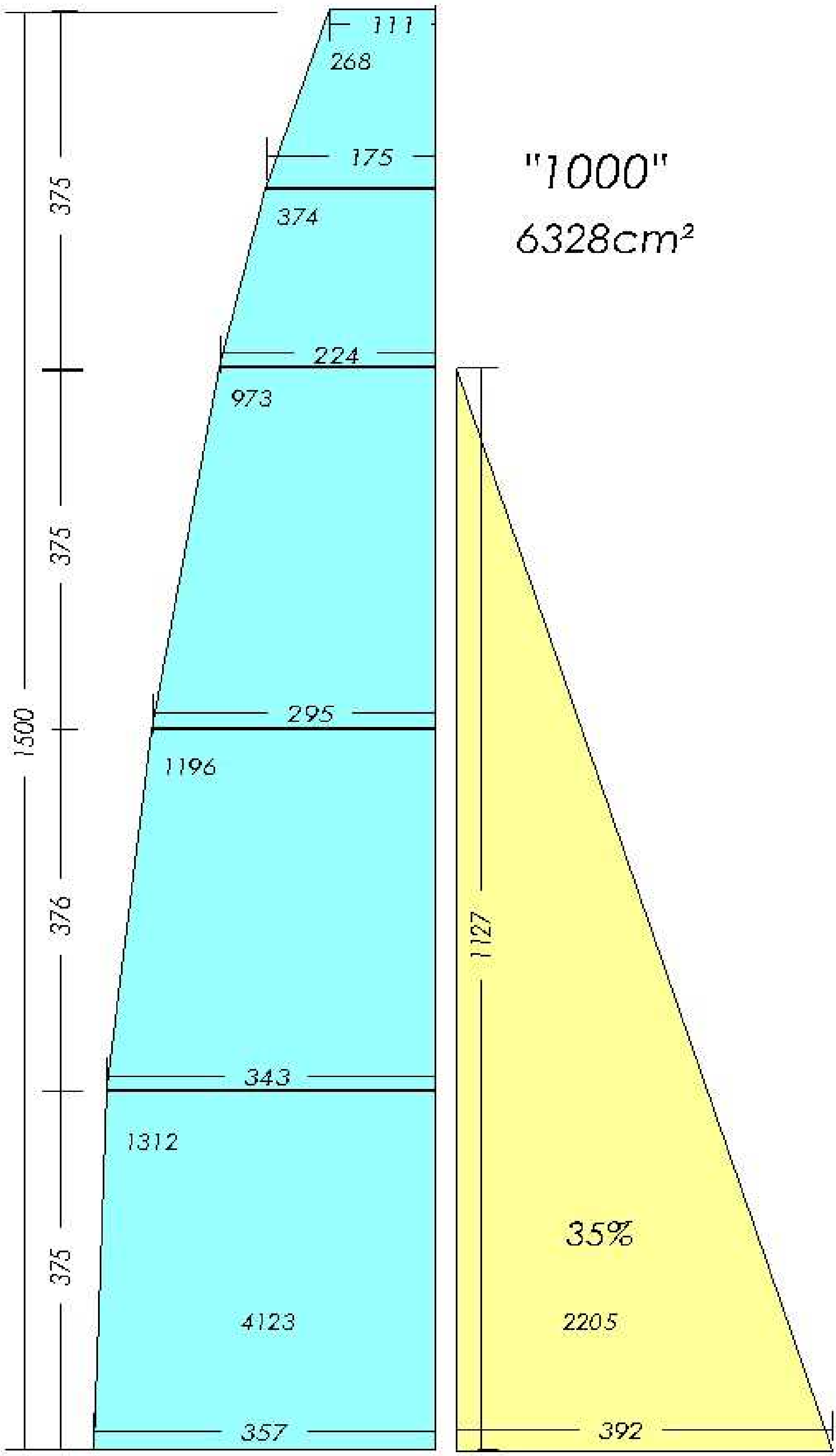
For this '1000' Design, the Sail Surface range can go from 5850cm² up to 6400cm² under low wind conditions.

Next page the SA plan for 5850cm² with a Jib at 35% of SA.

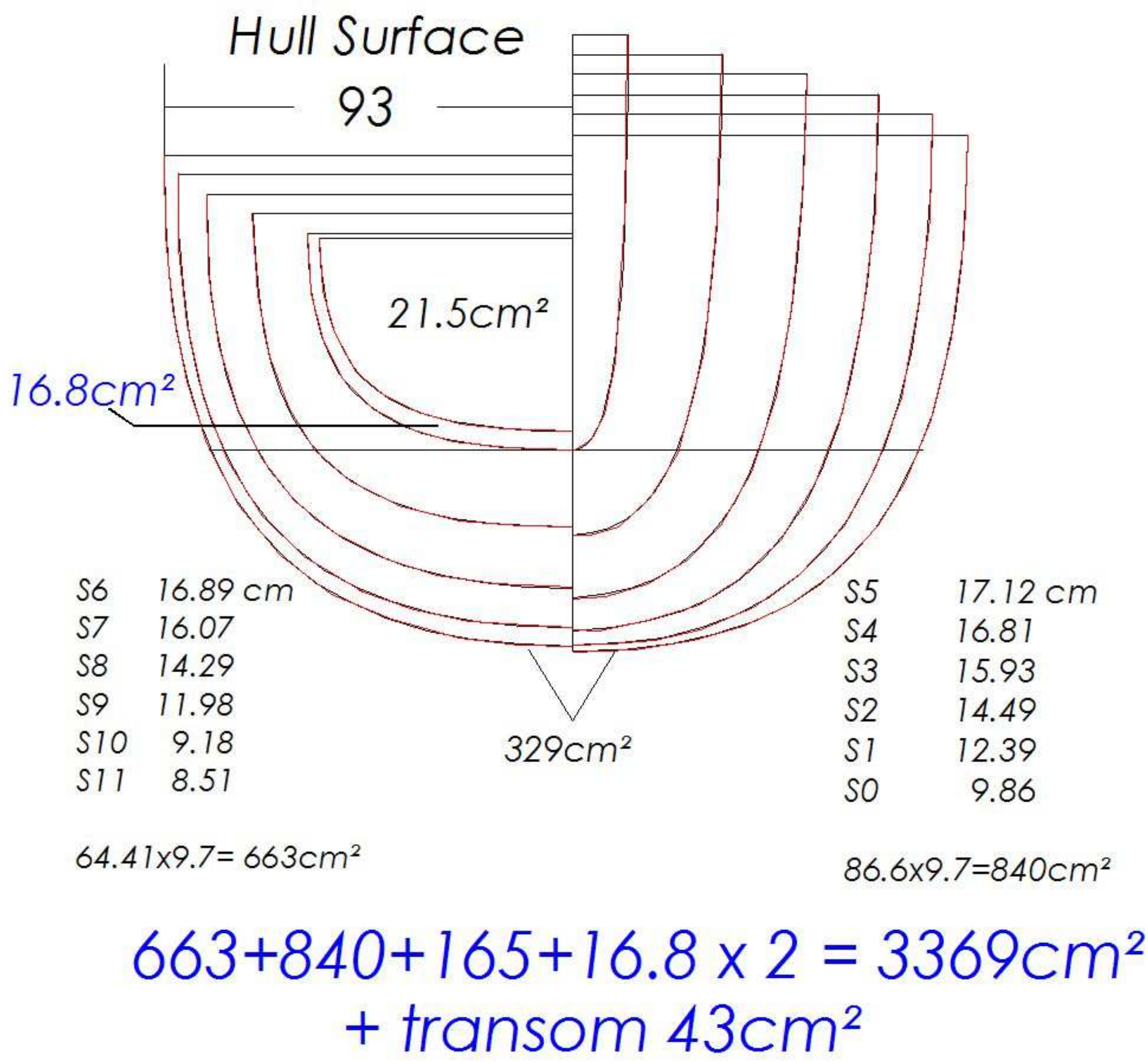
Sail Plan for this model design with 150cm luff



Another Sail Plan



Hull Surface calculation

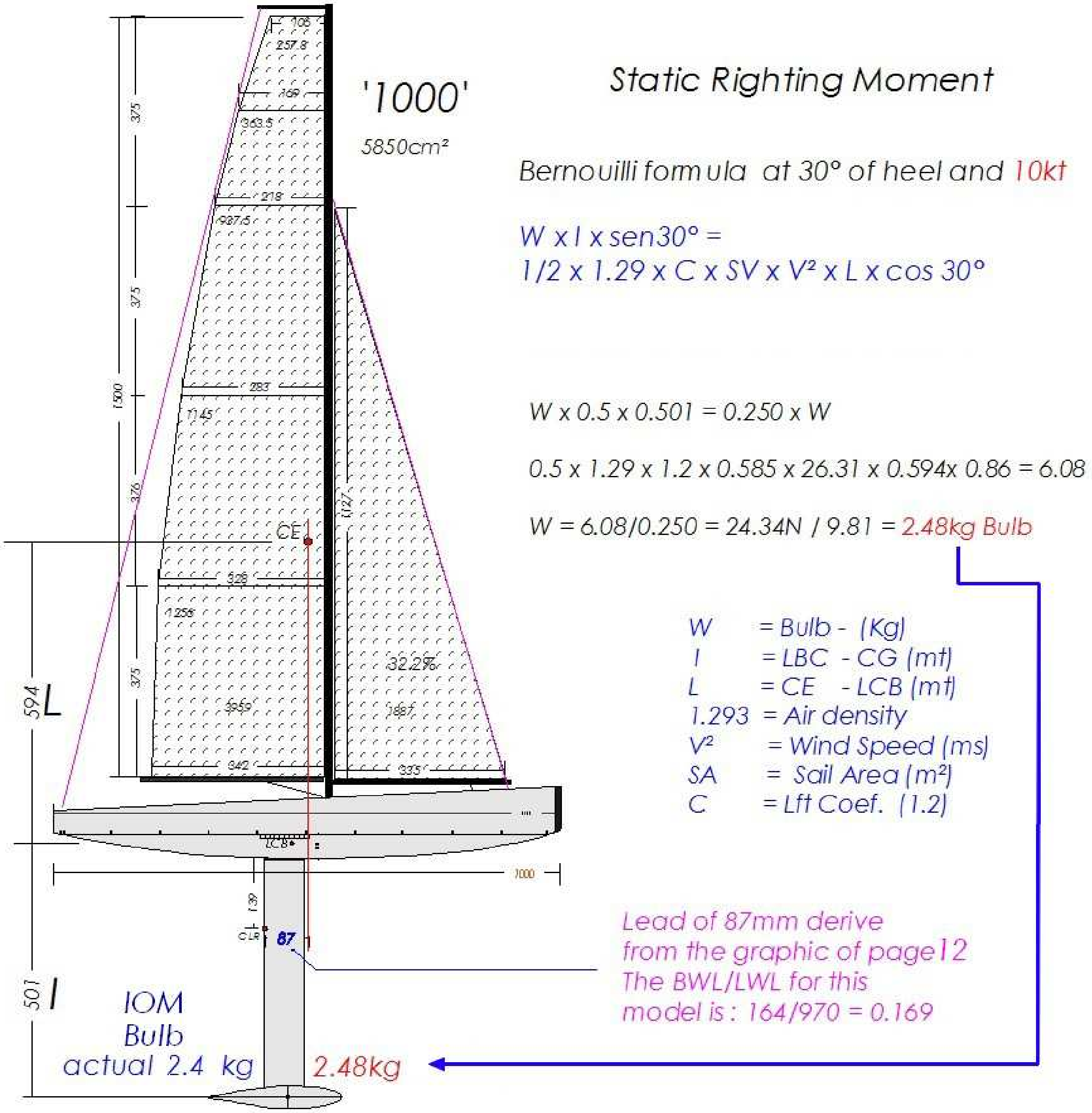


In the Budget was proposed before any drawing the Hull Surface of 35dm²

After finalization of the present design the Hull Surface is **33.69dm²**
The projected hull weight will be with 3 layers of 80g/m² :

0.8 x 3 x 2 (because of epoxy resin) x 33.69 dm² = 161.7g
instead of 175g

Deck Surface calculated: 1367cm²

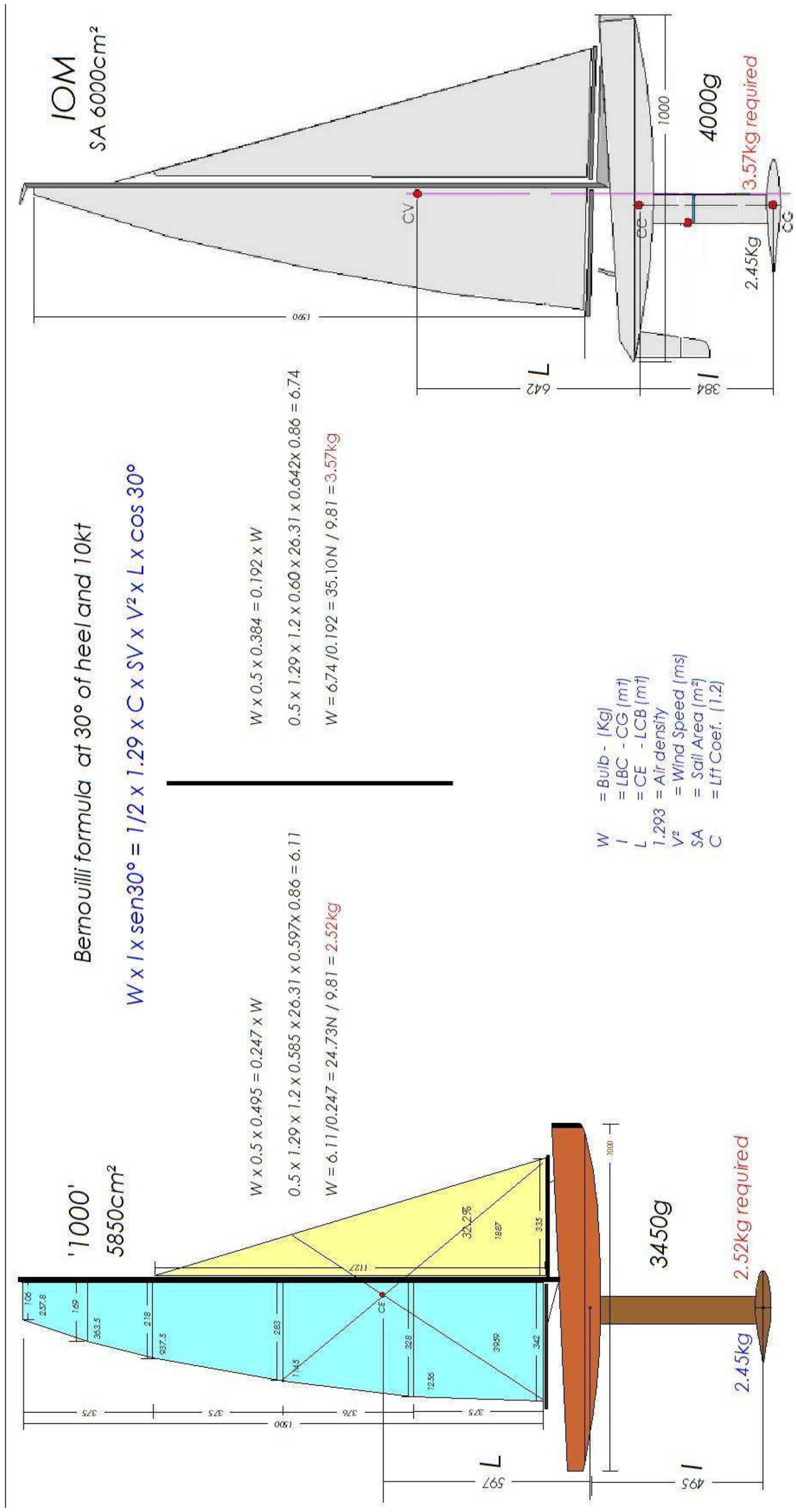


Static Righting moment at 10kt

This is a pessimistic evaluation since the Wind is hitting the sail at 90° while there is always an angle.
For Wind above 10Kt it may be necessary to reduce the Sail Area.

Next page IOM & '1000' are compared under the same conditions.

Compare Righting moment for IOM & 1000



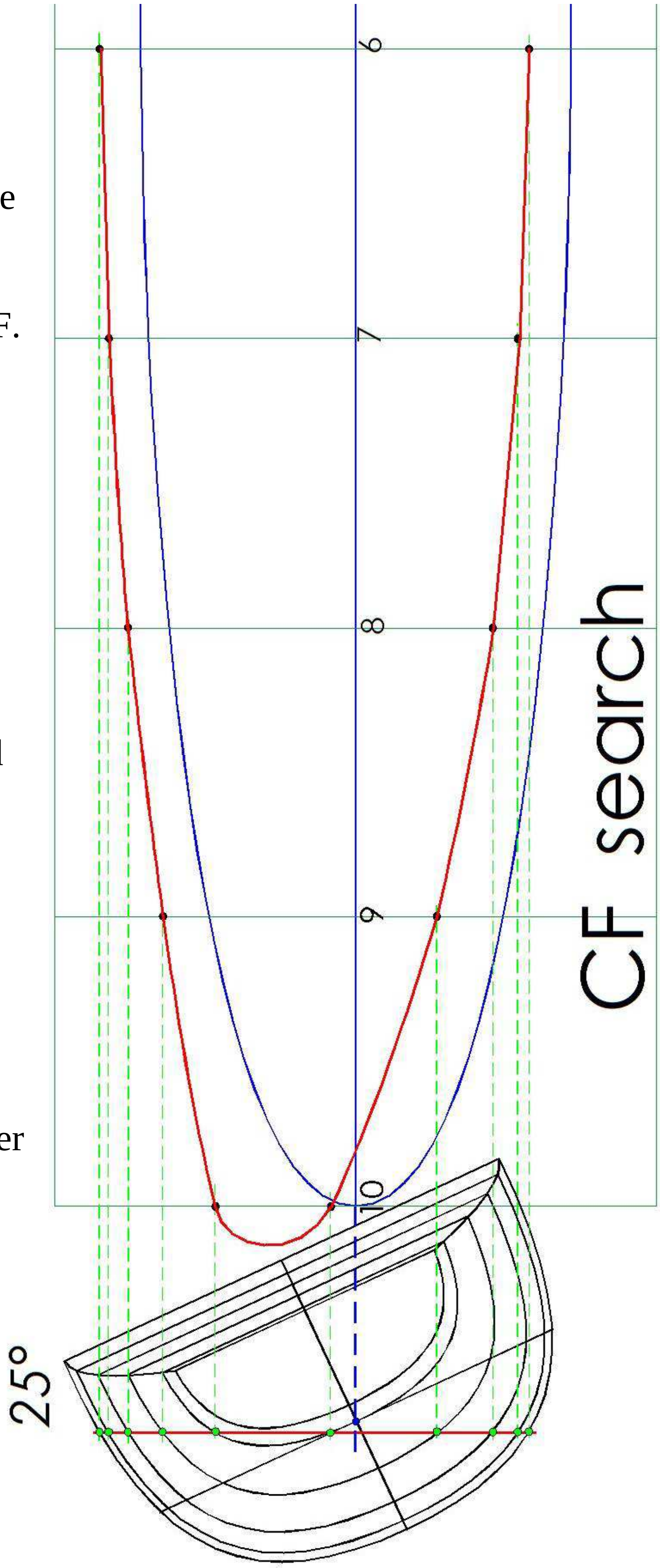
Since I do not possess
any 3D Software, even
tough I could not be able
to use it, this is my
rudimentary
way to search for the CF.

In order to find the
Center of Flotation
The group of shadows
is tilted by 25°.

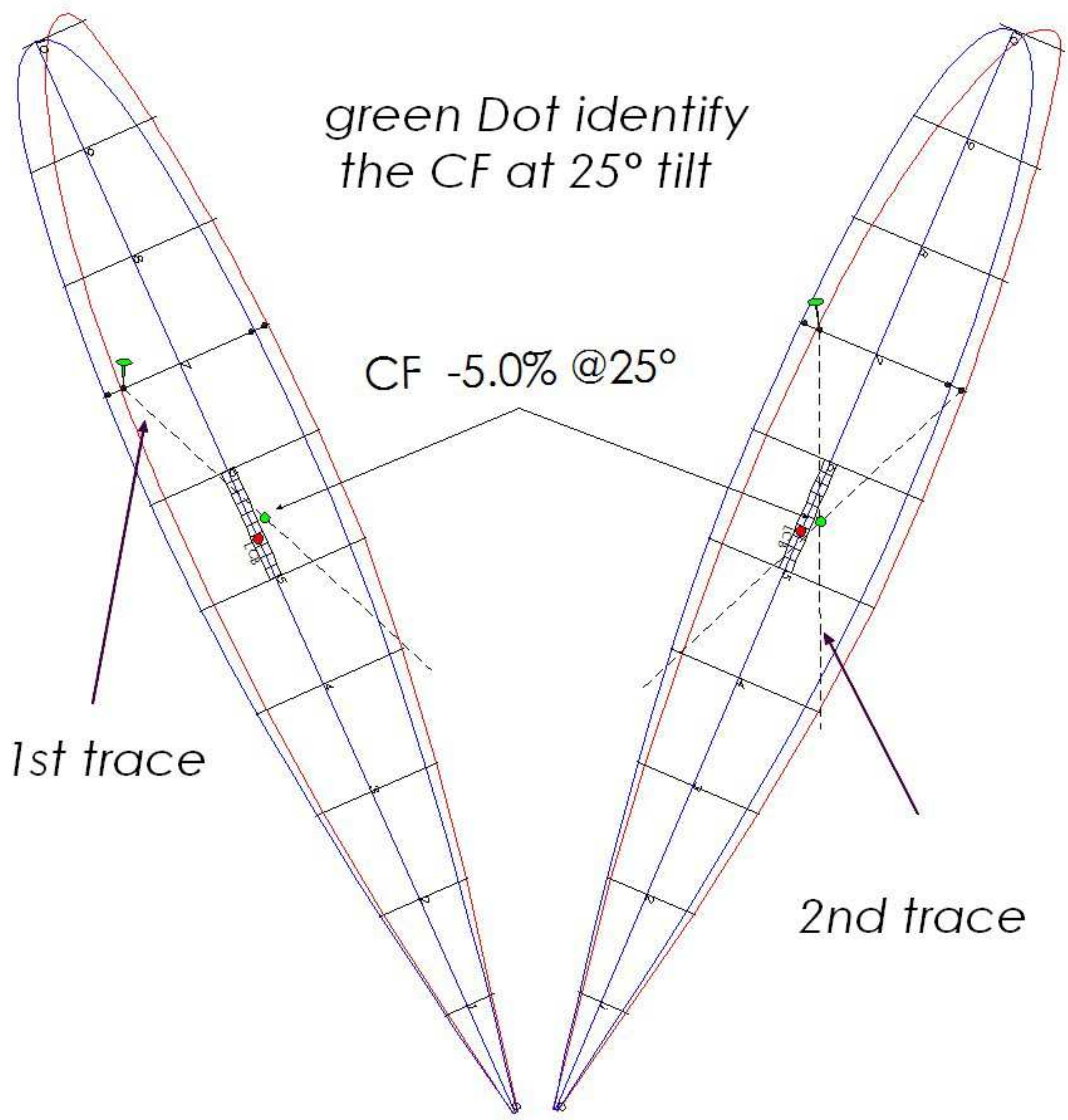
After having positioned
the new LWL at 25°,
I start connecting the
green crossing lines and
marking with a dot the
meeting points.

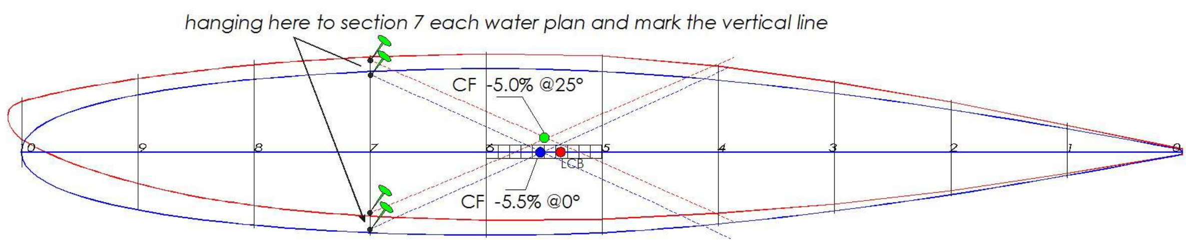
The new water plan is
just being traced.
See Red line.

The drawing will be
Completed with the other
half toward the Bow.



Hanging operation





At the end, two Dots obtained representing the CF at 25° and 0°. Important for the stability is that the CF at 25° is a bit forward to the other one at 0°

The '1000' Model drawings are based upon the sailing performances of the AC100 as well on the Esterel 45.

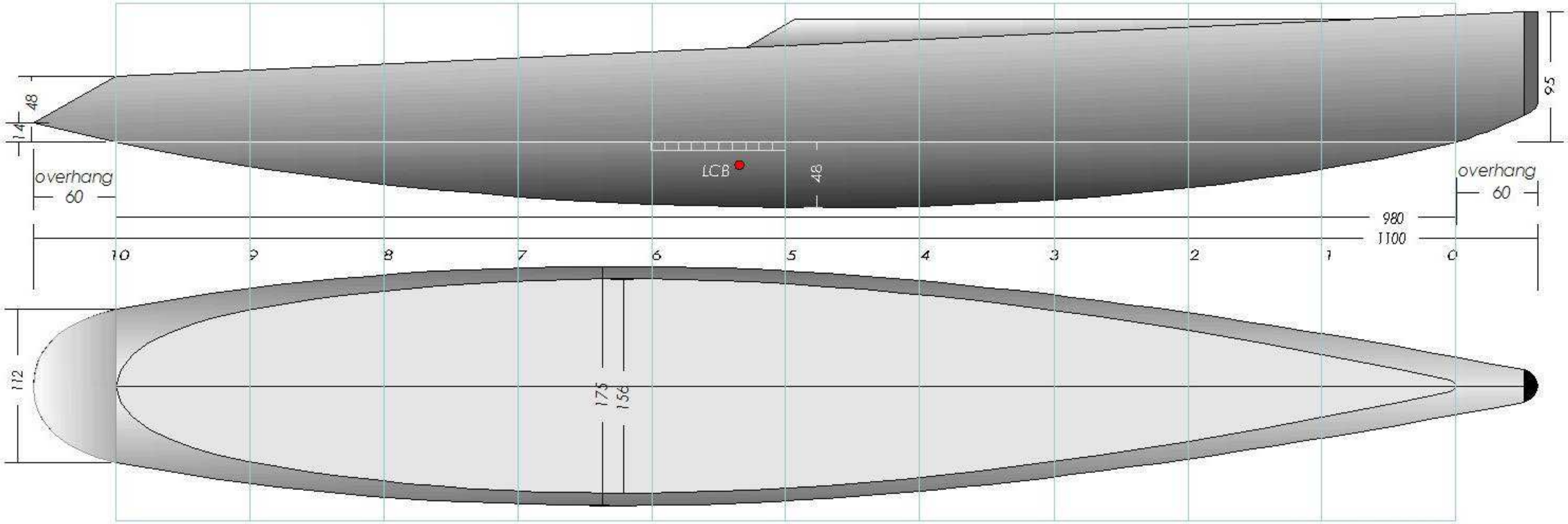
For the development may be understandable that the '1000' Project could perform better compared to similar size models because :

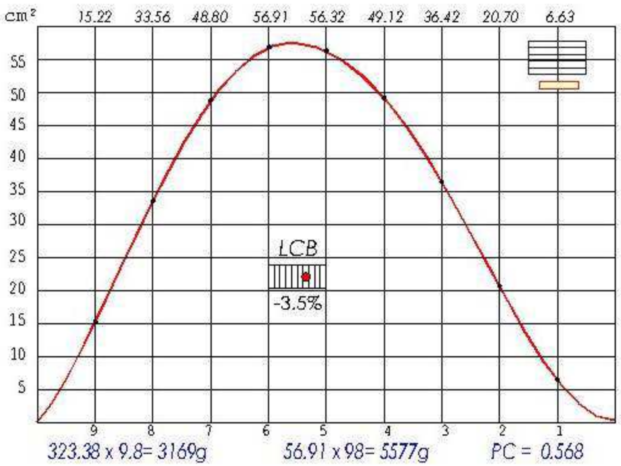
- Same length as IOM
- Is lighter, -550g from IOM – almost 15% less
- Employ the same IOM Bulb of 2400g, no need to make one
- Has shorter Main Luff (150cm) hence lower CE for stability
- Employ modern Sail Area with wide top, better efficiency
- Employ a deeper Fin, precaution to avoid Wet Area increase
- Appendices are at 6.5% of Sail Area. Can be reduced for stronger wind.

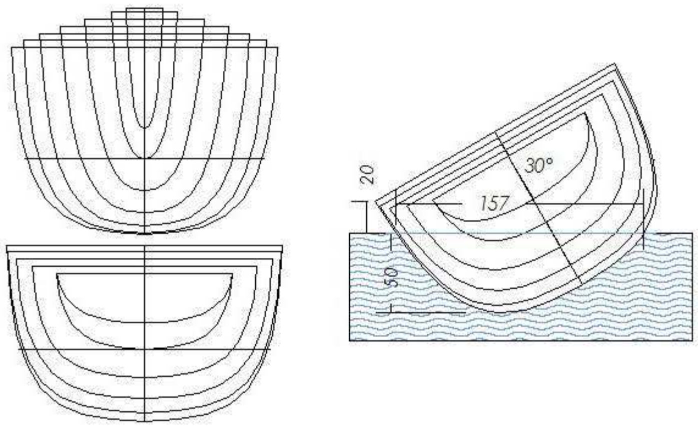
"The 110cm Model"

Because I have mentioned somewhere about the benefits of Overhangs, I have modified the previous "1000" design.

Conclusion, the boat length is increased up to 1100mm while the LWL is fixed at 980mm.
The Appendices and Bulb are the same

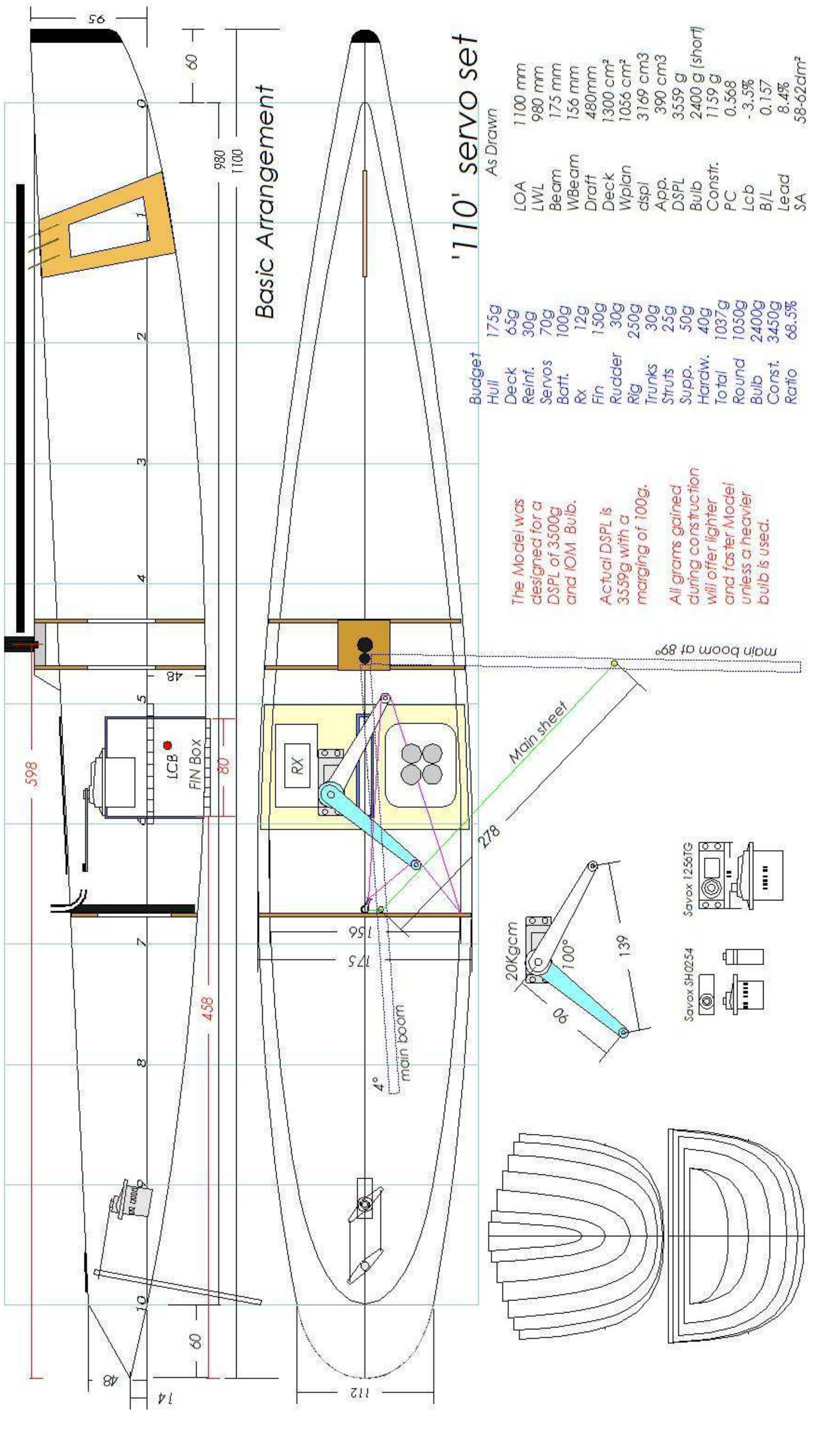


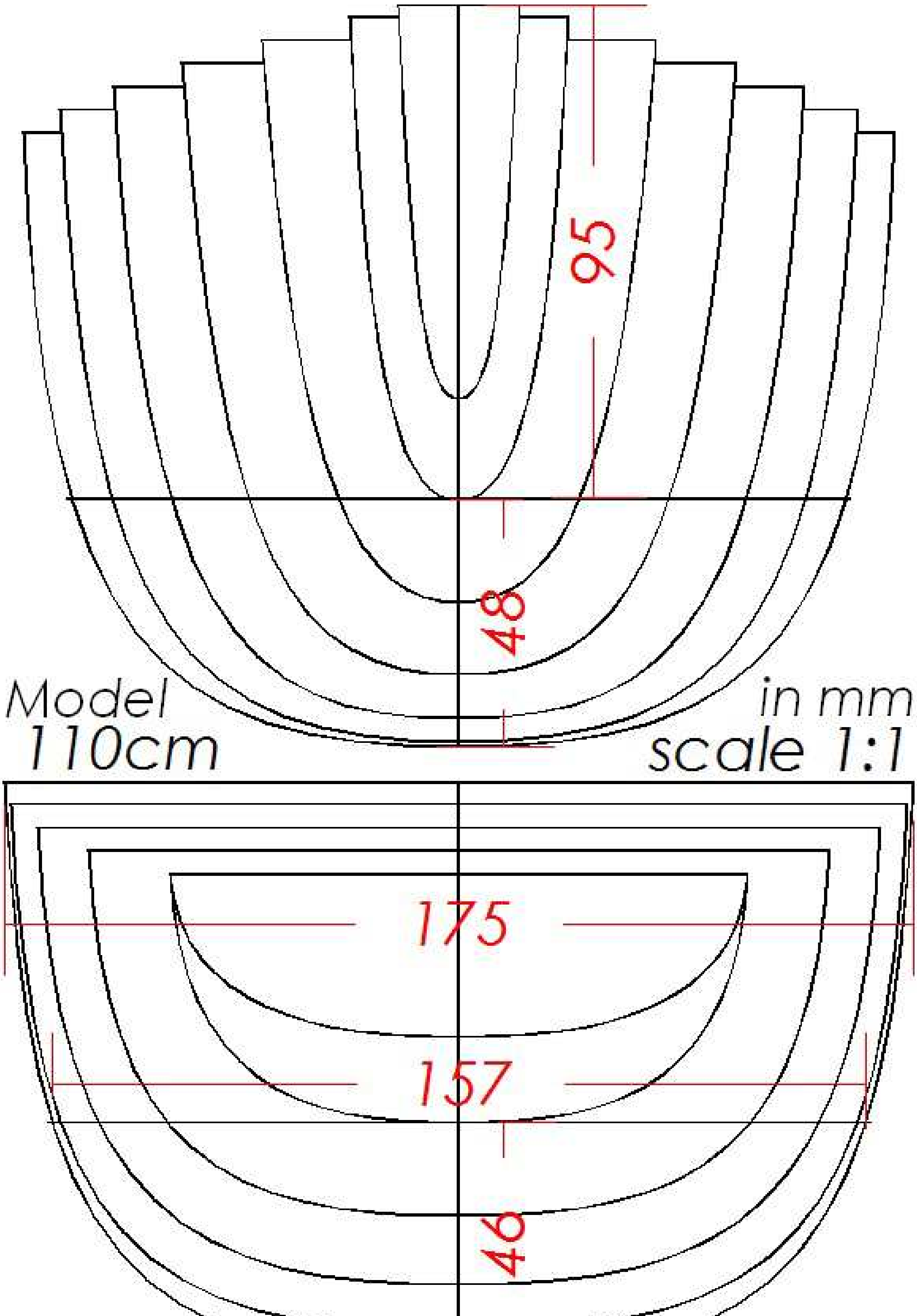




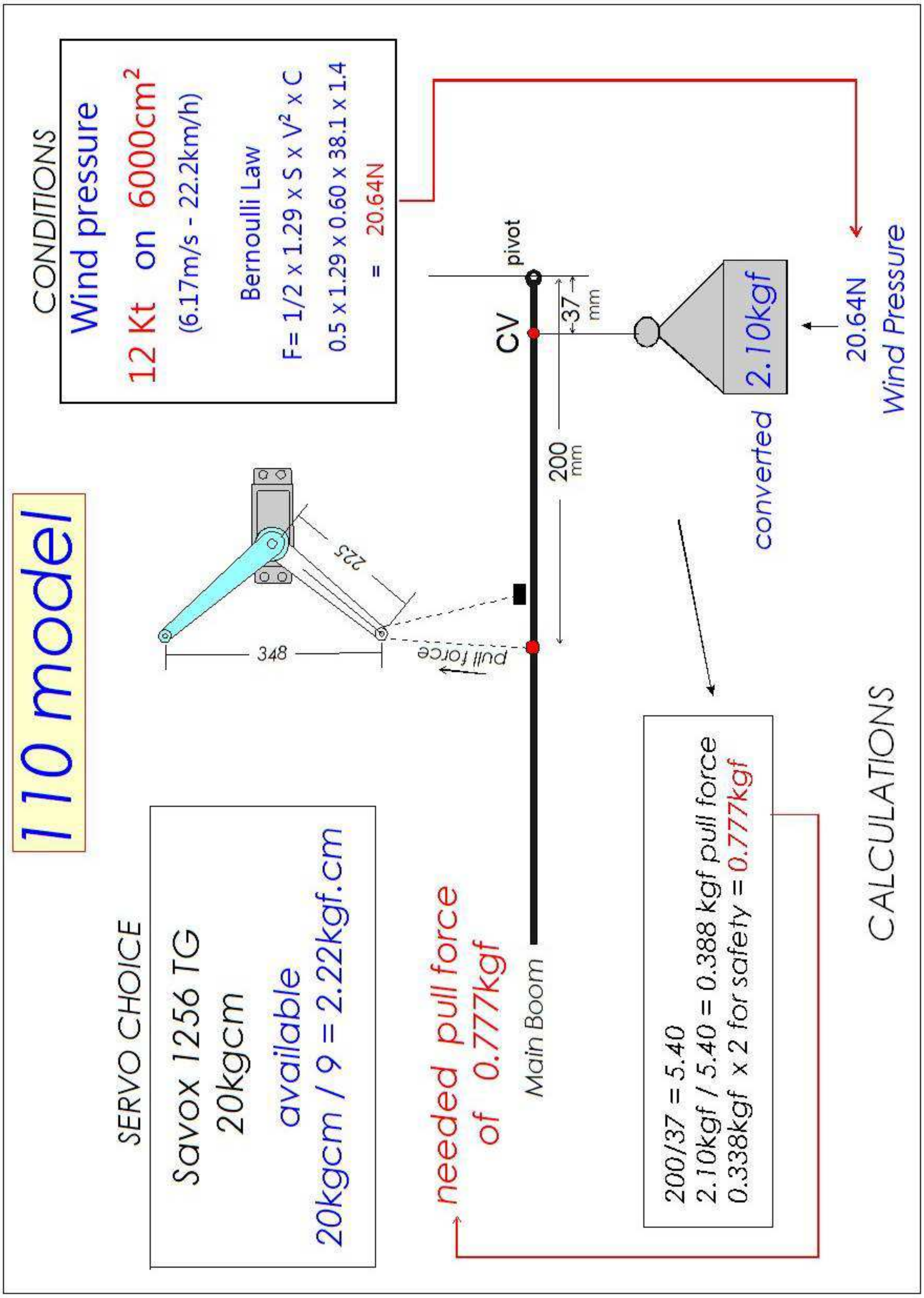
43.3in / 110cm

LOA	1100 mm
LWL	980mm
Beam	175 mm
WBeam	156 mm
Draft	480mm
Deck	1300 cm²
Wplan	1056 cm²
dspl	3169 g
App.	390 g
DSPL	3559 g
Bulb	2400 g (short)
Constr.	1159 g
PC	0.568
Lcb	- 3.5%
B/L	0.157
Lead	8.4%
SA	58-62dm²


Basic Arrangement
'110' servo set
As Drawn
LOA 1100 mm
LWL 980 mm
Beam 175 mm
WBeam 156 mm
Draft 480mm
Deck 1300 cm²
Wplan 1056 cm²
dspl 3169 cm3
App. 390 cm3
DSPL 3559 g
Bulb 2400 g (short)
Constr. 1159 g
PC 0.568
Lcb -3.5%
B/L 0.157
Lead 8.4%
SA 58-62dm²
Budget
Hull 175g
Deck 65g
Reinf. 30g
Servos 70g
Batt. 100g
Rx 12g
Fin 150g
Rudder 30g
Rig 250g
Trunks 30g
Struts 25g
Supp. 50g
Hardw. 40g
Total 1037g
Round 1050g
Bulb 2400g
Const. 3450g
Ratio 68.5%
The Model was designed for a DSPL of 3500g and IOM Bulb.
Actual DSPL is 3559g with a marging of 100g.
All grams gained during construction will offer lighter and faster Model unless a heavier bulb is used.
main boom at 89°
Main sheet
278
main boom
4°
LCB
FIN Box
RX
598
458
80
48
60
95
980
1100
156
175
112
14
20Kgcm
100°
139
90
Savox 1256TG
Savox SH0254


95
48
Model
110cm
in mm
scale 1:1
175
157
46

Once the basic conditions are retained, it is necessary to check the feasibility where the Electronics are a major issue in particular the Servo choice and Battery to cope with the Weight Budget.

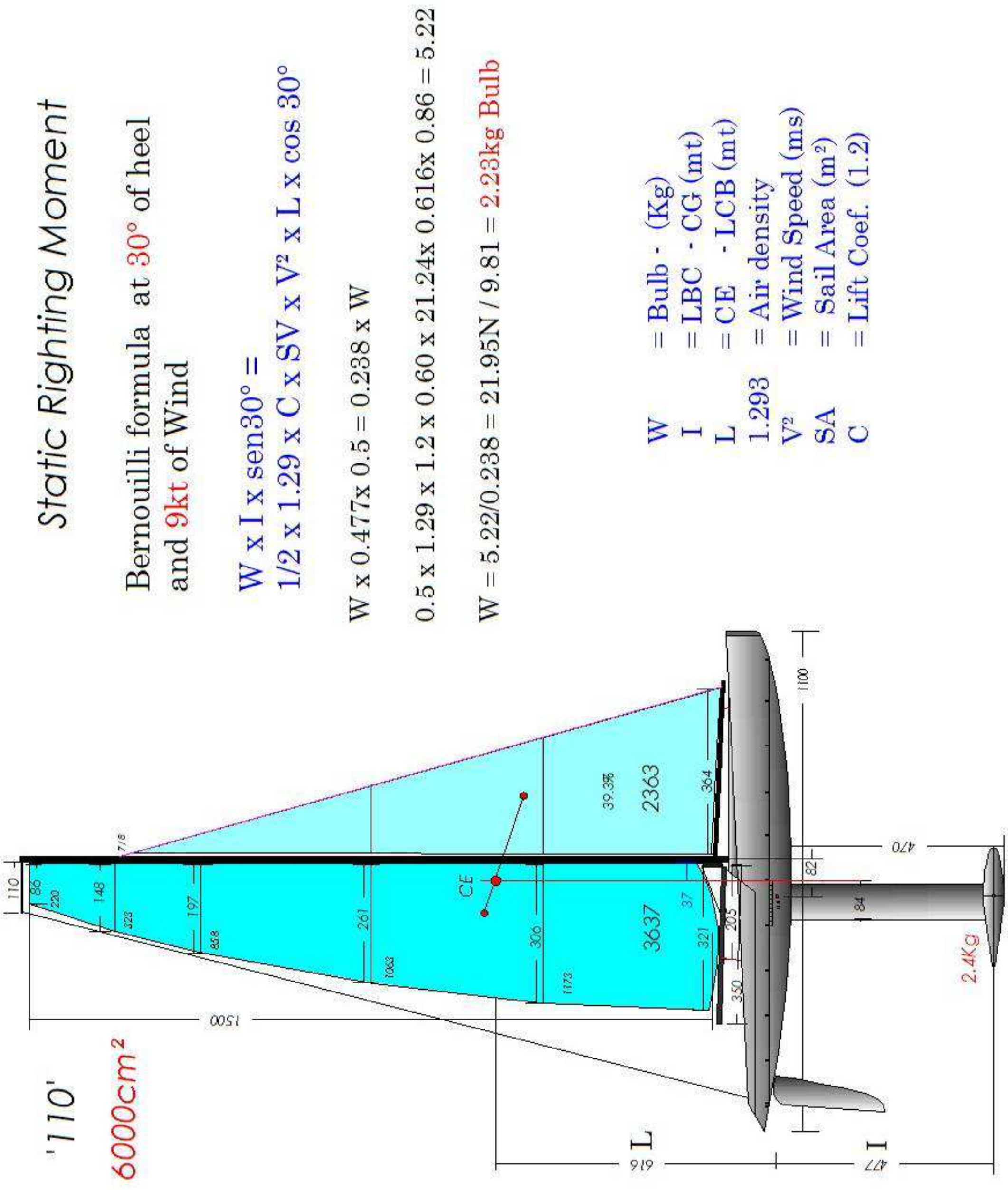


I could not go any further without the Righting Moment verification.

This is not a perfect method although pessimistic, but sufficient to evaluate the Bulb needed versus the Wind Speed.

In this analysis can be seen that the Bulb weight required for 9Kt of Wind and 6000cm² of Sail Area will be 2.2kg while the actual bulb weight by design is 2.4 kg.

The Heeling considered is 30°.



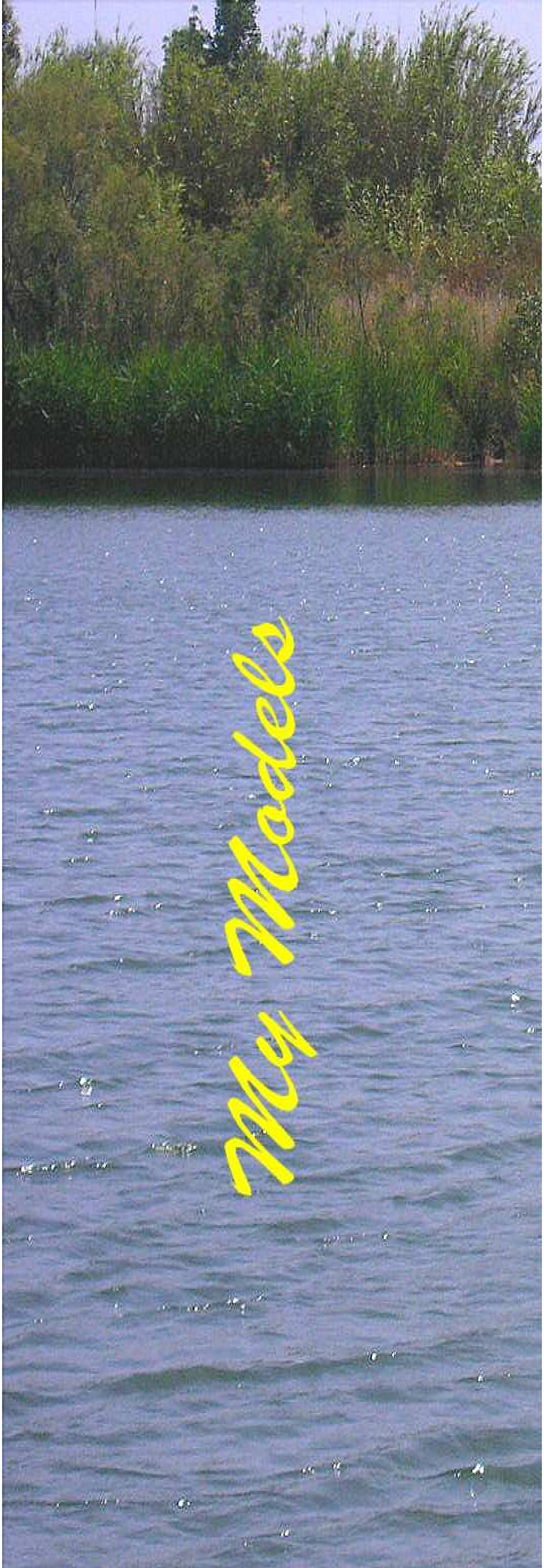
This concludes my RC Model design approach.

I'm open to questions: Claudio36@orange.fr

If no reply is because I do not have the answer or I'm dead !

ClaudioD


STUDIO-3 at Villepey


My Models